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IJMS INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

International Journal of Medical Students
The International Journal of Medical Students (IJMS) is a peer-reviewed open-access journal (ISSN 2076-6327) created to share the scientific production and experiences of medical students and recently graduated physicians worldwide.

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Year 2021 - Volume 9 - Issue 4

IJMS

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The *International Journal of Medical Students* (IJMS) is a peer-reviewed, open-access journal created to share the scientific production and experiences of medical students worldwide. Our objective is to be the primary diffusion platform for medical students, using standards that follow the process of scientific publication.

The Journal receives contributions and unpublished manuscripts of Original Articles, Short Communications, Reviews, and Case Reports, which are reviewed by experts (Peer-Reviewers) who have previously published similar research. In addition, the Journal accepts Interviews, Experiences, and Letters reviewed by the Editorial Team. This supports the quality and validity of the publications. The time between submission and final publication in most cases has been two to four months depending on the diligence of Peer-Reviewers and Authors.

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Editorial

Is It Worth Publishing in a Medical Students' Journal? Insights From a 10-Year Journey

Francisco J. Bonilla-Escobar,[1] Ciara Egan,[2] Mihnea-Alexandru Găman.[3]

Very little has been said about young scientists publishing in Journals that are led and carried forward by medical students or recently graduated physicians themselves. What has been said, however, is not always supportive. For some, these Journals should not exist, arguing that medical student research is for the sole purpose of training or rather, it should be aimed at reaching the level of rigor and impact held by other professional journals. For others, the lack of indexing and impact make these Journals a place where potential visibility and recognition is lost. Yet, there is a community of believers who see us as a way to improve science by training the next generation from the onset of their careers. A for-students, by-students Journal is the crossroads between publication, and therefore visibility, of student research, and a training ground for the ins and outs of peer-review and the writing standards held in science and medicine. With time, the rigor and excellence of these journals grows, and indexing follows.

The future generation of physician scientists is in dire need of growth, as there are more of them retiring that there are newly graduating.[1] Medical student research is therefore a need of the whole world, and it should begin in the early stages of their careers. Yet, research curriculums in medical schools have a wide spectrum of aims, teaching techniques, and resources. This leads to vast differences in the opportunities available to students depending on where they study. The world of research and investigation fantastically breaks down these walls and engaged, motivated students learn to find their way. Student journals can be the places where these boundaries are taken down and allow students from any background and institution to mature and succeed.

At the IJMS we strive to be a place for all medical students to come and join a community of student researchers aiming at excellent, publishable manuscripts. Working with medical students' research from all over the world is inspiring.[2] Every day we receive research and experiences that connect us as a community and push the Journal towards higher levels of commitment and quality of work. The community of authors that we have seen growing steadily in the last couple of years has its repercussions in both the number of articles and issues we publish. For this ninth volume, we have increased the number of issues to four per year to better serve our community. In addition, we just went through a new expansion of our Associate and Student Editors in order to keep up with the submissions. This growth is moving use forward in our plans to be indexed. We are not yet indexed in the National Library of Medicine of the United States, but it is on the horizon for us.

Being a student or recent graduate and working to keep a journal for students alive is not an easy task. There is not a class in medical school about how to be an editor or a peer-reviewer. Classically, these skills are learned on the go and through trial and error. The Journal day-to-day work, its online platform for publication, and its standards and scope truly are realized and improved every day. Our peer-review process has been normalized across the board through online courses that train students on how to review articles systematically and thoroughly. On a larger scale, the Journal is guided by organizations we apply to join (i.e., COPE) and by the guidelines we must adhere to for our publications (i.e., University of Pittsburgh Library System). At IJMS, we aim for everyone involved with the Journal, editors and authors alike, to grow and mature as young scientists with each publication and issue we have.

As a young student-scientist, is it worth your time and effort to publish in a Journal for medical students? We believe so. Beyond visibility of your work in the online research world, you join a community that wants you to succeed as a researcher. You will be supporting your fellow medical students by sustaining this community. Furthermore, with time and a commitment to excellence, the IJMS will grow in its impact and indexing. We are a place of dialogue and exchange of ideas for students, and we strive for medical students' and recently graduated physicians' research work to always have a place in the medical scientist arena.

A step away from our 10th anniversary, publishing non-stop, we celebrate this with the announcement that our aim to be indexed in PubMed/MEDLINE is stronger than ever and that the Journal is thriving in its publishing indicators. Only in the last 12 months (January 1st 2021 up to December 6th 2021), we have had 317 submissions, an acceptance rate of 19%, 123 days to acceptance since submission, and 29 days from submission to rejection. If we compare these numbers with the previous year, we had 316 submissions, an acceptance rate of 33%, 180 days from submission to acceptance, and 110 days to rejection. In addition, our next issue (Volume 10 Issue 1 of 2022) is almost ready for publication more than three months before the publication deadline.

The above-mentioned goals and achievements could not have been reached without our team of Associate Editors, Student Editors, Layout Editors, Communications and Public Relationships Committee, and Editorial Board. In this Editorial, we acknowledge the members of our Editorial Team who participated the most, were permanently active in the Journal, and provided exceptional feedback or performed outstandingly in their assigned tasks: ***Sohaib Hasseb*** as the Associate Editor of the Year 2021, ***Adnan Mujanovic,*** *and* ***Joseph Tonge*** as the Student Editors of the Year 2021, ***Sajjad Ali*** as the Layout Editor of the Year 2021. A special acknowledgement goes to ***Madeleine J. Cox and Andrew Thomas*** who besides being excellent Student Editors are being promoted to Associate Editors. We make a special mention to ***Dr. Georgiana Farrugia*** as our outgoing Director of Communications and Public Relationship. She has done an extraordinary job in this position and our social networks status are evidence of her legacy. The International Journal of Medical Students is probably one of the few journals that requires the entire Editorial Team to be certified in the art of peer-review. Thus, all our staff has graduated from The Publons Academy, a peer-review course within the Clarivate Analytics (former Institute for Scientific Information, ISI), and has received a certified status of peer-reviewer after having evaluated two papers under the

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supervision of a mentor.[3] Currently, as the Publons Academy was recently integrated into the Web of Science Academy, we request our editorial team members to complete the following courses: *An introduction to Peer-Review*, *Reviewing in the Sciences*, *Good Citation Behavior*, and *Co-reviewing with a Mentor*.[4] The effort invested into the evaluation of manuscripts submitted to the IJMS certifies that we are dedicated to publishing only work of the highest quality.

This issue is full of relevant research for medical students and the entire scientific community, including research on COVID-19 and other relevant topics. This last issue of 2021 revolves around seven original articles, one short communication, one case report and four experiences written by medical students from all over the world.

Apart from this editorial, we reinforce our support for climate change, as discussed at the United Nations Climate Change Conference (COP26) held recently in Glasgow. Thus, we have decided to publish an editorial piece on climate change and biodiversity that begins with an interesting motto: "The Health Community Must Step Up Its Efforts to Hold Countries Accountable for Reducing Greenhouse Emissions and Promoting Adaptation".[5]

The COVID-19 pandemic remains the focus of five original research articles published in this issue, with a peculiar emphasis on the importance of mental and psychological health during these difficult times. Babatunde et al. evaluated the impact of the COVID-19 lockdown on depression severity and the use of drugs among university students from Ibadan, Nigeria, reporting that symptoms of mild depression, measured using the Patient Health Questionnaire (PHQ-9), were experienced by approximately 41% of the subjects who partook in the study. Fortunately, the use of psychoactive substances was low and was not influenced by the lockdowns enforced during the pandemic.[6] Depression, anxiety, and psychological stress were fairly common in another investigation recruiting adults from India (24%, 14%, and 17%, suffered from the aforementioned ailments, respectively) as evidenced by Prakash et al.[7] Jenkins and Grasso also presented interesting data regarding the frequency (nearly 38%) of serious adverse pandemic-related experiences (e.g., increased conflict, less physical activity, frequent substance use) in a sample of medical students from the United States of America. Students who spent more time caring for patients diagnosed with the SARS-CoV-2 infection were more likely to deal with such psychological distress and to suffer from anxiety, depression, and post-traumatic stress disorder.[8]

Odeyemi et al. explored the knowledge, attitude, and practices towards the preventive strategies against the COVID-19 pandemic among young adults from Nigeria. The researchers revealed that there is optimism that the pandemic will eventually be controlled; however, the use of face masks by the respondents was influenced by their level of education, ethnicity, and other factors.[9] Ethnicity was also related to the risk of acquiring COVID-19 in a sample of nearly 2,000 adults from the United States. Hispanics were more likely to test positive for SARS-CoV-2 and this relationship was mediated by social determinants of health risk factors, as reported by Verdini et al.[10] Furthermore, due to the importance of involving any available healthcare worker in the fight against the COVID-19 pandemic, Bernard et al. proposed a pandemic leadership model for medical students based on several overarching themes, namely Communication, Other-Orientation, Personal Characteristics, Decisive Action, and Use of Information.[11]

The second half of the issue is more focused on medical students and education. Zeller et al. prospectively compared pocket-sized ultrasound and cardiac auscultation in diagnosing cardiac valve pathologies by medical students, revealing that training in the former technique improves their ability to identify heart valve disorders.[12] Silver et al. implemented a series of storytelling events on the topic of formative medical experiences in order to combat burnout and promote mindfulness and wellness which benefited all participants, but in particular medical students.[13] In their case presentation, Mohamed et al. pointed out that the use of ring pessaries, a conservative approach method employed in the treatment of pelvic organ prolapse, may results in a severe but rare complication, i.e., rectovaginal fistula.[14] The four experience pieces of the issue span a variety of relevant topics in the career of any healthcare professional: gender bias, gender equity and the prevalence of stereotypes in clinical medicine and surgery, volunteering in times of war, and health promotion using medical education.[15-18]

We move into the New Year with high expectations and hope to keep this Journal flourishing and growing. We wish everyone in the community Happy Holidays. We resolve to continue growing the Journal, and we look forward to you joining us in this adventure. Cheers!

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ULS

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Editorial

COP26 and Health: Some Progress, But Too Slow and Not Enough

The Health Community Must Step Up Its Efforts to Hold Countries Accountable for Reducing Greenhouse Emissions and Promoting Adaptation

Laurie Laybourn-Langton,[1] Richard Smith.[2]

The editorial on climate change and biodiversity published in over 220 health journals in September had two main demands: keep global temperature increases below 1.5°C above pre-industrial levels to avoid catastrophic damage to health; and accept that this can be achieved only by rich countries making bigger cuts in greenhouse gas emissions and transferring substantial resources to the countries' most vulnerable the effects of climate change.[1] Neither demand was fully met at COP26 in Glasgow. The editorial was also aiming to make the voice of the health community more prominent in global discussions on climate change and environmental destruction. Some progress was made with this aim, but again not enough.

Although the mantra of COP26 was "keep 1.5°C alive," the pledges made by countries to reduce emissions are insufficient to keep the temperature rise to below 1.5°C. Before COP26, the United Nations estimated that current pledges will lead to an increase of 2.7°C, a level that would lead to devastating effects on health through extreme weather events, crop failure, water shortages, forced migration, conflict, and a rise in sea level that will mean the disappearance of some island countries.[2] Even with the additional pledges made at COP26, temperatures are expected to rise well above 2°C.[3]

Christina Figueres, the head of the UN climate change convention in 2015 that achieved the Paris agreement, argues, however, that COP26 has made the aim of 1.5°C widely accepted, removing the aim of "below 2°C" that emerged in Paris.[4] Countries are now required to review their pledges—called Nationally Declared Contributions (NDCs) in UN speak—every year rather than every five years as at present. There is, however, no system of enforcement, and countries often fail to meet the pledges they make. Promises are easy; implementation is hard.

For the first time the final COP26 agreement mentioned fossil fuels, the source of most of the greenhouse gases.[5] Countries agreed to accelerate "efforts towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies." Countries like India and China that depend heavily on coal for their energy supply insisted on the word "phasedown" of coal rather than the original "phase out."[6] It is a small success to have coal and fossil fuels mentioned in the final agreement, but at the same time the weak wording is a sign of the absolute failure of the world to adequately address the crisis.

The $100bn support for low income and other vulnerable countries, which was promised back in Paris, did not materialize in Glasgow. It is now expected by 2023, deepening antagonisms between rich and vulnerable countries over the inequity of the global response to phasing out fossil fuels. There was, however, a greater emphasis on the need for more adaptation funding, as the editorial in the journals requested. Countries and their people are recognizing that climate change is here now not in the future. Vulnerable countries wanted a "Glasgow loss and damage facility," which would see funds passing from rich countries to vulnerable countries as compensation for the damage the rich countries have caused and continue to cause. Rich countries squashed this facility, greatly angering the vulnerable countries.

The editorial in the health journals sought to connect the climate element of the environmental crisis with other damage to nature, including biodiversity loss, deforestation, harm to the oceans, and soil destruction. COP26 did see $20bn committed for forest protection, and more than 100 countries, including those with the largest forests, pledged to reverse deforestation by 2030 at the latest – though a similar pledge had already been made in 2014. Generally, however, broader damage to nature did not feature, which is partly because the UN process largely creates a separation between climate change, the focus of COP26, and biodiversity, which is being considered next year at a conference in China.

Business featured prominently at COP26. If the world is to reach net-zero then business —like every other activity— will have to play its part. Many businesses have committed to reach net-zero and, perhaps more importantly, investors have discovered that there is money to be made from investing in genuinely green projects and money to be lost by investing in fossil fuels, which are rapidly becoming stranded assets. However, net zero pledges made by businesses have attracted considerable doubts – and many remain full of loop holes, including allowing for continued investment in fossil fuels - leading the climate activist Greta Thunberg to call the conference "a global north greenwash festival, a two-week long celebration of business as usual and blah blah blah."[7] In response, the UN Secretary General has committed to establishing a "greenwashing" watchdog.[8]

Health was more prominent in COP26 than in any previous COPs in that the WHO had a health pavilion for the first time and health had an hour-long session with ministers in the main part of the meeting. The health pavilion featured dozens of sessions, most of which are available online.

Patricia Espinosa, the executive secretary of the United Nations Framework Convention on Climate Change, was expected to appear alongside the UK's senior health minister at the health session in the main part of the meeting, but neither attended. The meeting did, however, feature two British ministers, representatives of Fiji and Egypt governments, a former British prime minister, a senior official from the US government, the chief executive of GSK, and others. The representative from Fiji said that in his region more people are already dying from climate change that any other cause, and the US representative told the audience that the US accounts for a quarter of all global emissions from health systems, which if they were a country would be the fifth largest emitter of greenhouse gases. Most health systems currently have rising emissions.[9]

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Fifty countries committed at COP26 to "take concrete steps towards creating climate-resilient health systems."[10] Argentina, Fiji, Malawi, Spain, the United Arab Emirates, the US, and 39 others will achieve low-carbon, sustainable health systems, while Bangladesh, Ethiopia, the Maldives, the Netherlands, and 45 others have committed to enhance the climate resilience of their health systems.

Nobody knows how to achieve net zero within a health system, but we do know that everything, including clinical practice, will have to change; about two thirds of the emissions come from suppliers, meaning that they too will have to reach net zero; and research and innovation will be essential. Funding for research on climate change and health has been small, but the UK minister announced a new fund for research on climate change and health.

Despite greater attention to health, the word health appeared only once in the final document agreed at the meeting: "[countries,] when taking action to address climate change, respect, promote and consider their respective obligations on… the right to health."[11]

John Kerry, the US climate envoy who was at the original earth summit in Rio de Janeiro in 1992 and deeply involved in negotiating the agreement at the Paris COP, acknowledged that COP26 was never going to solve the climate crisis completely. But, he said, "Paris built the arena, Glasgow starts the race… When we leave Glasgow, our password will be implementation, follow-up and follow-up."[12,13]

His words ring true for the health community. Restricting the rise in global temperature to 1.5°C is still possible with emergency action, and we must continue to emphasize the extreme danger to health from temperatures rising above 1.5°C and the great benefits to health that can result from countries decarbonizing their economies. We must encourage countries to be bolder in cutting emissions, promoting adaptation, supporting vulnerable countries – and do more to hold them to account. We must also concentrate on implementation, particularly within health systems where we have most influence.

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Original Article

Knowledge, Attitude, and Practices Towards Preventive Strategies Against COVID-19 Pandemic Among Nigerian Young Adults: A Cross-Sectional Survey

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Abstract

Background: Since the onset of the COVID-19 pandemic, efforts have been aimed at promoting preventive measures towards curtailing the spread of the SARS-CoV-2 virus. The effectiveness of measures put in place by the government are mostly determined by the Knowledge, Attitude, and Practices (KAP) of the citizenry. We sought to determine the KAP of young Nigerian adults towards preventive strategies against COVID-19. **Methods:** An online survey was prepared using an 18-question questionnaire to assess the KAP of each participant that satisfied predefined criteria. Data obtained were screened for error and analyzed with SPSS version 23. The level of significance was set at $p<0.05$. **Results:** A total of 925 valid responses were received with a 96.25% response rate. Females made up 52.4% of the respondents, 62.4% were aged between 21-24, and 88.4% were from South-western Nigeria. The mean knowledge score was 9.02 (SD 1.18) with a maximum possible knowledge score of 13. Most of the participants (91.7%) agreed that COVID-19 will eventually be successfully controlled. Only 31.1% however had been wearing masks when leaving home. The confidence of winning the battle against COVID-19 differed significantly across the ethnic groups ($p<0.01$). Ages between 15 and 24 were more likely to visit crowded places ($p<0.01$). **Conclusion:** This study revealed a good knowledge level and an optimistic attitude towards the control of the COVID-19 pandemic. However, much more work is needed by government and health officials to translate these to better practices towards prevention and control as the fight against the COVID-19 pandemic continues.

Key Words: Attitude; Coronavirus Disease 2019; Knowledge; Prevention (Source: MeSH-NLM).

Introduction

The Coronavirus Disease 2019 (COVID-19) is an illness caused by the novel Coronavirus also called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS - CoV-2), which was first discovered during an outbreak of respiratory illness in Wuhan, Hubei province, China, and reported to the World Health Organization (WHO) on the 31st of December, 2019.[1] COVID-19 was declared a global health emergency on the 30th of January, 2020, and was subsequently declared a pandemic on the 11th of March, 2020.[1,2,3]

The nomenclature of the disease has undergone rigorous reviews as the WHO termed the deadly virus COVID-19 to avoid any form of discrimination based on region, person, or nationality. In this light, particular mention is given to the efforts of the Coronavirus Study Group of the International Committee on the Taxonomy of Viruses, which on the 11th of February, 2020 issued a statement officially designating the novel virus as SARS - CoV-2.[4] It is important to note that the coronaviruses as a family are not necessarily unique to humans and that they have the potential to cause pandemics, hence the occurrence of the Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

Since the outbreak of the COVID-19 there has been a steady rise in the number of confirmed cases of the disease all over the world, including Nigeria. As of 22nd of August, 2021, a total of 211,288,358 cases had been confirmed, with 4,422,666 confirmed deaths in 209 countries and territories, with a possible surge in the number of cases subsequently.[5] This has prompted extraordinary measures on the part of governments worldwide to curb the spread of the virus. Such measures include stay-at-home orders, self-isolation and quarantine of visitors, the use of hand sanitizers and washing of hands in public places, enforcement of social distancing protocols, and the use of facemasks in public places, amongst others.[6]

Research into the transmission of the disease shows that people at higher risk of infection include individuals with a travel history to countries with a high number of confirmed cases, health workers caring for COVID-19 patients, and close contacts of infected patients.[7] Once infected, the SARS-CoV-2 virus has a more severe course in the elderly (65 years and above) and those with longstanding chronic illnesses.[8] Major symptoms of the disease include fever, cough, fatigue, and body aches. Other less common symptoms include diarrhea, loss of sense of taste or smell, headaches, shortness of breath, and respiratory distress. Dyspnea is typically associated with a more severe infection.[8–10] It has been shown that about one-third of infections may be asymptomatic, although this does not exclude the ability to infect.[10] Since the discovery of COVID-19, the transmission of the disease has grown from local to community transmission, necessitating strict measures instituted by the Nigerian government in order to curtail it. While there is a growing need and attempt to understand the pathogenesis of this coronavirus, the government and various parastatals continue to ensure compliance to the already constituted measures.[11]

Despite the growing attention given to COVID-19 in Nigeria and globally, there is still a lot of misinformation about the virus. More so, compliance with the safety measures and precautions is largely dependent on how informed the citizens are about the coronavirus based on evidence from previous disease outbreaks such as the Ebola virus.[11] The young adults occupy a larger portion of the Nigerian population either as students at different levels of education or as "working-class" and are prone to risky behaviors that could jeopardize effort by the government and health care workers in combating the

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spread of the virus. Early studies in Nigeria showed a mortality rate of about 2.6% and a preponderance of the male gender.[12] Despite the available data in Nigeria and globally, there is a need to objectively assess how informed the Nigerian youths are about the coronavirus. Knowledge assessment is an important precedence to COVID-19 guidelines adherence. This study aims to assess the knowledge, attitudes, and practices regarding COVID-19 among young adults in Nigeria. Data from this study will be beneficial to the Nigeria Center for Disease Control and potentially to other low-income nations in the fight against the COVID-19 pandemic.

Methods

Study Design and Setting

This was a cross-sectional study based on a survey of young adults in southwestern Nigeria, which includes Lagos, Oyo, Ondo, Ekiti, Ondo, and Ogun state or other states in Nigeria. Participants were recruited into the study by convenience sampling using a web-based questionnaire designed in Google Forms. This method of data collection was adopted due to the restriction in movement imposed by the Nigerian government as one of the measures to curb the spread of the Coronavirus Disease 2019. Study participants were encouraged to share the link to the survey with others on their various social media timelines.

Study Participants

The study inclusion criteria were being a young adult with 16 to 35 years of age, from Nigeria, who reside in any of the states in southwestern Nigeria and who granted informed consent and permission to share collected data. The exclusion criteria included Nigerian young adults who resided outside the country as of the data collection period and/or outside the age bracket (16-35). In addition, participants who partially completed their questionnaire were excluded from the study. All respondents were recruited into the study by convenience sampling method.

Data Collection

The link to the online survey was shared via social media platforms (Whatsapp, Twitter, and Facebook) using the authors' immediate social network and each participant was encouraged to do so too. Data was collected in the two-week period of April 19 to May 3, 2020. Accompanying the questionnaire was a poster that represented the cover page of the questionnaire and contained information about the purpose of the study, anonymity of participants' responses, and voluntariness of participation. Those who read the poster would then further answer a question as to whether they are willing to participate or not. Participants who selected a "YES" (as indicative of a willingness to be recruited into the survey) could proceed to the questionnaire while those whose responses were "NO" to the consent question were automatically logged out of the form. The .csv file generated from the Google Form was exported to SPSS for data cleaning and analysis.

Research Tool

The self-administered questionnaire was sectioned into two: Sociodemographics and Knowledge, Attitude, and Practices (KAP) about COVID-19. The KAP aspect of the questionnaire was developed and adapted from a similar study carried out in China.[7] The internal consistency of the KAP questionnaire was acceptable (Cronbach alpha coefficient of 0.71 in the sampled population). The questionnaire was written in English language and was not translated into any Nigerian language. The sociodemographic section was composed of Age (16-20, 21-25, 26-30, and 31-35), Gender (Male, Female), Marital Status (Single, Married, Divorced, Engaged), Tribe (Yoruba, Hausa, Igbo, Others), State of residence of respondents included Southwestern states (Oyo, Lagos, Ekiti, Ogun, Ondo, and Osun state) and Others (other states outside southwestern Nigeria). The variable 'Religion' was categorized into Christianity, Islam, Traditional (African indigenous religions), and Others (religious practices that cannot be categorized as Christianity, Islam, and Traditional).

The Knowledge subsection was made up of thirteen questions (Clinical Presentation K1-K4, Route of Transmission K5-K7, Prevention, and Control of COVID-19 K8-K13 (***Table 1***). These questions were answered on a TRUE/FALSE. Every TRUE response was assigned 1 point while a FALSE was assigned 0. Overall, a maximum of 13 points was attainable for the knowledge questions if all questions were answered correctly. However, the level of knowledge of each respondent was further assessed by a grading system. Respondents with 0-4, 5-7, 8-10, and 11-13 were regarded as having poor, average, good, and excellent knowledge respectively.

The attitude of respondents towards the control of the COVID-19 was assessed by two questions (A1 and A2) assessing the respondents' belief in the future control of COVID-19 and if Nigeria as a nation could win the fight against the disease. Practices towards preventive strategies were measured with three questions (P1-P3) assessing the adherence of the participants to measures instituted by the government such as wearing of facemask, regular washing of hands, and avoiding crowded places.

Data Analysis

Data obtained were screened for errors and completeness, after which the data were analyzed using IBM-SPSS version 23 for Windows. Results were presented in frequency, percentage, mean, and standard deviation (SD). A Chi-square test was used to investigate whether there is a relationship between knowledge of COVID-19 and practices towards preventive strategies against COVID-19. Multivariate analysis was used to explore the association between sociodemographic characteristics of participants and knowledge of COVID 19. Significance was set at a p-value <0.05.

Ethics statement

Our study protocol, methodology, and tools were approved by the University of Ibadan and University College Hospital Ethical Committee with IRB of **UI/EC/20/0293** before the commencement of the research.

Results

A total of 961 responses were collected within two weeks from the first day the survey was launched. Of these respondents, 7 were excluded for not consenting to participate in the study, 10 were invalid, and 19 did not meet the eligibility criteria. Consequently, the data from 925 responses were considered valid for statistical analysis. Females constituted the majority of the study participants accounting for 52.4% (n=485) of the total. 62.4% (n=577) were between ages 21-25, 92.4% (n=855) practiced Christianity as a religion and 71.6% (n=662) were of the Yoruba ethnic group. 97.5% (n=901) of the study participants were single. 88.4% (n=818) of the participants were from South-western Nigeria and 69% (n=639) had a Bachelor's degree and above (***Table 2***).

Overall, 92.3% (n=853) of the study participants had a good to excellent knowledge score (***Figure 1***). The mean knowledge score was 9.02, SD 1.18 92.3% (n=854) agreed that the clinical symptoms of COVID-19 include fever, fatigue, dry cough, and body pains. Almost all the participants, 98.2% (n=908), believed that there was no cure for COVID-19 at the time of the study and that early symptomatic and supportive treatment can help most patients recover from the infection. 96.6% (n=894) believed that the virus spreads via respiratory droplets of infected individuals. Other responses are shown in ***Figure 2***. There was not a significant difference in knowledge scores across sociodemographic characteristics of participants.

The majority of the respondents agreed that COVID-19 will eventually be successfully controlled (n=848, 91.7%), and this attitude differed significantly across the different ethnic groups ($p<0.05$). Fewer participants, (n=788, 85.2%) selected 'yes' to the question "Do you have confidence that Nigeria can win the battle against the COVID-19 virus?". The confidence of winning the battle against COVID-19 differed significantly across the ethnic groups ($p<0.01$, ***Table 3***).

Table 1. Elements of the Questionnaire and Responses.

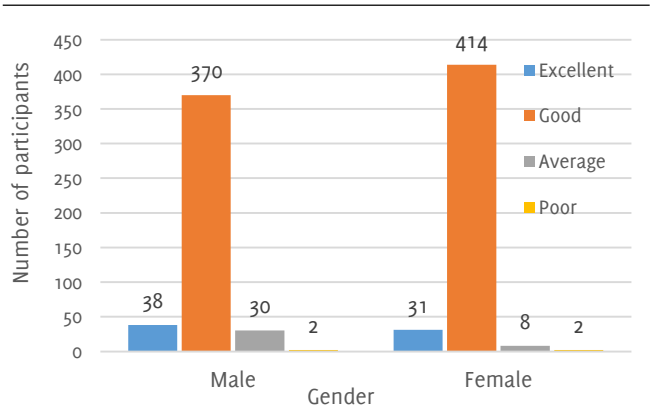
Questions	Options
Knowledge (correct rate, % of the total sample)	
K1. The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and body pains. (92.3)	True, False
K2. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with COVID-19 virus. (52.6)	True, False
K3. There currently is no effective cure for COVID-19 but early symptomatic and supportive treatment can help most patients recover from the infection. (98.2)	True, False
K4. Not all persons with COVID-19 will develop to severe cases. Only those who are elderly, have chronic illnesses, and are obese are more likely to be severe cases. (79.5)	True, False
K5. Eating or contact with wild animals would result in infection by the COVID-19 virus. (84.2)	True, False
K6. Persons with COVID-19 cannot transmit the virus to others when fever is not present. (95.8)	True, False
K7. The COVID-19 virus spreads via respiratory droplets of infected individuals. (96.6)	True, False
K8. Ordinary residents can wear general medical masks to prevent the infection by the COVID-19 virus. (64.0)	True, False
K9. It is not necessary for children and young adults to take measures to prevent the infection by the COVID-19 virus. (94.6)	True, False
K10. To prevent the infection by COVID-19, individuals should avoid going to crowded places such as train stations and avoid taking public transportation. (98.2)	True, False
K11. Isolation and treatment of people who are infected with the COVID-19 virus are effective ways to reduce the spread of the virus. (98.6)	True, False
K12. People who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. (98.5)	True, False
K13. In general, the observation period is 14 days. (98.2)	True, False
Attitudes	
A1. Do you agree that COVID-19 will finally be successfully controlled?	Agree, Disagree
A2. Do you have confidence that Nigeria can win the battle against the COVID-19 virus?	Yes, No
Practices	
P1. In recent days, have you gone to any crowded place?	Yes, No
P2. In recent days, have you worn a mask when leaving home?	Yes, No
P3. In recent days, have you been washing your hands regularly?	Yes, No

In regards to practices towards prevention of the disease, 83.9% (n=775) of the participants responded that they had not been to any crowded place in recent days (***Figure 3***). There was a very strong association with age group and knowledge level at p<0.01 (***Table 4***). 92% (n=851) responded that they had been washing their hands regularly. There was a significant association with gender, marital status, and level of education (p<0.05) (***Table 4***). However, only 31.1% (n=288) of participants with tertiary education or more had been wearing masks when leaving home, (***Figure 3***) and there was a significant association between wearing masks when leaving home and the level of education (p<0.05). There was a significant association between regular hand washing and knowledge of COVID-19 (p<0.001). The multivariate analysis yielded no significant finding.

Table 2. Demographic Characteristics of Participants and Knowledge Score About COVID-19 by Demographic Variables.

Characteristics	Number of participants (%)	Knowledge score (mean ± SD)	p-value
Gender			
Female	485 (52.4)	9.0 ± 1.2	0.586
Male	440 (47.6)	9.1 ± 1.2	
Age group (years)			
16-20	184 (19.9)	9.0 ± 1.2	
21-25	577 (62.4)	9.0 ± 1.2	0.354
26-30	128 (13.8)	9.2 ± 1.1	
31-35	36 (3.9)	9.4 ± 0.8	
Religion			
Christianity	855 (92.4)	9.0 ±1.2	
Islam	59 (6.4)	9.1 ± 1.4	0.435
Traditional	2 (0.2)	10.5 ± 0.7	
Others	9 (1.0)	8.6 ± 0.7	
Ethnicity			
Yoruba	662 (71.6)	9.0 ± 1.2	
Igbo	162 (17.5)	9.0 ± 1.3	0.097
Hausa	5 (0.5)	9.2 ± 1.3	
Others	96 (10.4)	9.1 ± 1.1	
Marital status			
Single	902 (97.5)	9.0 ± 1.2	
Engaged	1(0.1)	8.0	0.998
Married	21 (2.3)	9.4 ± 0.9	
Divorced	1 (0.1)	9.0	
Highest level of education			
Secondary	213 (23)	8.9 ± 1.2	
Associate degree	73 (7.9)	9.0 ± 1.6	0.668
Bachelor degree	585 (63.2)	9.1 ± 1.1	
Masters and above	54 (5.8)	9.1 ± 1.1	
Current state of residence			
Southwest	818 (88.4)		0.913
Others	107 (11.6)		

Figure 1. Knowledge Level of Participants by Gender.

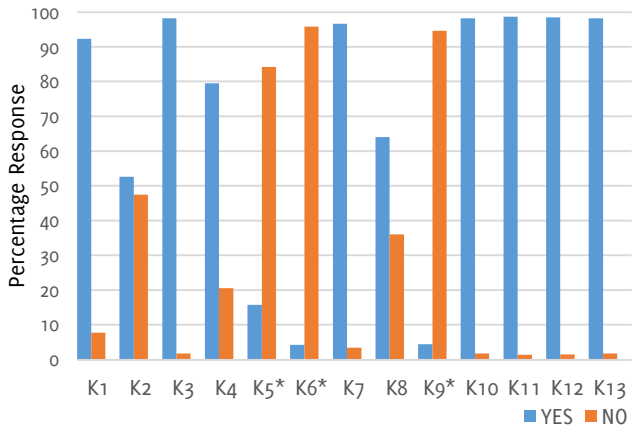


Discussion

The Coronavirus Disease 2019, universally known as COVID-19, was first discovered in Wuhan City, China.[13] Following its discovery, the disease subsequently spread to over two hundred countries of the world, causing global disarray and posing threats to all aspects of human endeavors.[14–16]

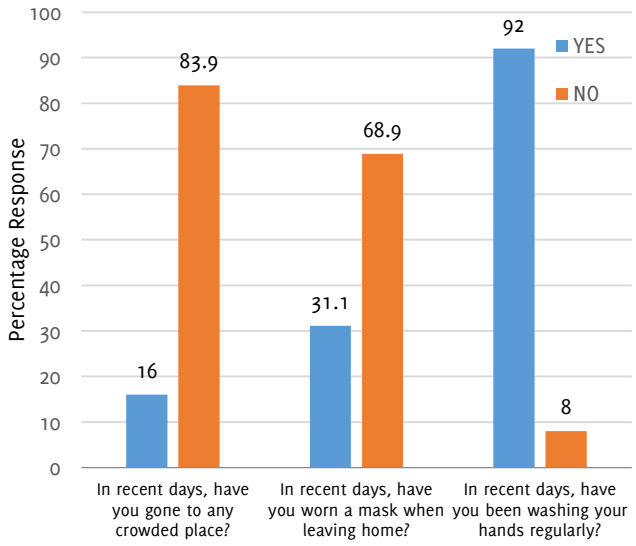
Nigeria is the largest and most populated country in Africa, with a population size of over two hundred million people. [17] As a densely populated country, Nigeria is at greater risk of spreading the coronavirus among its citizens given the already established mode of spread and risk factors.[9,11] The Nigerian population is largely constituted by children and young people, given the life expectancy of Nigerians.[17,18] During the early phase of the pandemic in Nigeria, one of the reasons for this study was the rising belief about the immunity of young people to the virus, a belief that led to the non-compliance to guidelines put in place by the Federal Ministry of Health (FMoH) by the youths. Future approaches could include the population of people over 35 years of age, to understand if there is a difference in KAP among these populations. This study, therefore, provides objectively measured epidemiological data to assess the KAP of COVID-19 among this set of Nigerians.

Figure 2. Percentages of Responses to Each of the Knowledge Questions.



Legend: * "No" is the appropriate response

Figure 3. Percentage Responses to Questions on Preventive Strategies Against COVID-19.



In this study, there were more female participants (52.4%) than males and the majority were single individuals (97.5%). The overall knowledge score in this study was 9 out of a total score of 13, which means that most the respondents have good knowledge of COVID-19. These findings are in line with previously published data in India, Egypt, and China.[19–23] The high overall knowledge of COVID-19 as seen in this study may be partly because the majority of the respondents have a minimum of tertiary education or degrees. This is in tandem with findings from other studies conducted within and outside of Nigeria.[11,19,20] Likewise, it is common knowledge that the sample population in this study is more acclimatized to the internet and social media which were the major means of sensitizing various population groups about the COVID-19 pandemic during the rapid rising phase of the disease in Nigeria.[6,7] Internet and social medial have also been documented to have played a tremendous role in keeping the people informed about the COVID-19 pandemic as documented in other studies.[6,24] This agrees with our findings, meanwhile, the Nigeria Center for Disease Control (NCDC) sends daily text messages to educate the people about measures to curb the infection and spread of the virus. Knowledge of the prevention and control of COVID-19 was interestingly higher when compared to other COVID-19 knowledge questions and most of the participants generally believed that there is no cure for the coronavirus disease (***Table 1***). Good knowledge of COVID-19 as documented in this study is consistent with that of Isah et al., a study conducted in the Northern part of Nigeria where, despite adequate knowledge of COVID-19 among the participants, adherence to preventive measures is still challenged by misconceptions about the virus.[25] These findings are in tandem with that of Nwagbara et al., a trend that is consistent in many indigenous African studies. This trend is predominant in many African studies contrary to findings in other continents.[26]

When explored, there was no association found between knowledge scores and sociodemographic characteristics of participants in this study. However, when compared to their married counterpart, respondents whose marital status was single had a lower COVID-19 knowledge score. This finding could be because unmarried people tend to be care-free sometimes as compared to married ones who may be eager to know more about the disease due to the lives of immediate family members such as children and spouses.[6,7,27] In addition, the mean knowledge score was lower among participants with lower educational qualifications (***Table 2***). In an Ugandan study, females were found more adherent to preventive measures against COVID-19 than males.[28] This is similar to the finding in this study, in which a greater proportion of females were more likely to adhere to preventive practices compared to males (***Table 4***).

Practices towards preventive strategies by each participant were assessed using three questions (P1-P3, ***Table 1***). Overall, positive responses towards the preventive strategies against COVID-19 were recorded, as over seventy percent of respondents were complying with the social distancing practices and avoidance of crowded places and regular washing and/or sanitizing of hands (***Table 3*** and ***4***). On the contrary, greater than sixty percent of the respondents denied the use of face masks when going out to public places despite evidence showing the effectiveness of face masks in reducing the infection and transmission of the coronavirus. According to Reuben et al., knowledge of COVID-19 does not match up with practices towards the virus.[6] Meanwhile, Kim et al. documented that having a family member infected with the virus and a higher socioeconomic status were both correlated with good attitudes and practices towards the virus.[29] Various factors could have been responsible for the poor compliance with the use of face masks among these young people, one of which could have been the exponential rise in the price of face masks as a result of its limited availability and inflated prices.[30-32] Second, this sample population believes they are immune to the virus and this could have influenced their compliance with mask usage. Furthermore, the non-use of face masks may have been influenced by early statements from health authorities in which it was not clear whether their use was effective or not.

Table 3. Attitudes Towards COVID-19 by Demographic Variables.

Characteristics	Attitudes, n (%)					
	Final success in controlling			Confidence of winning		
	Agree	Disagree		Yes	No	
Gender			p-value			p- value
Female	450 (92.8)	35 (7.2)		422 (87.0)	63 (13.0)	
Male	398 (90.5)	42 (9.5)	0.200	367 (83.4)	73 (16.6)	0.122
Age group (years)						
16-20	168 (91.3)	16 (8.7)		158 (85.9)	26 (14.1)	
21-25	529 (91.7)	48 (8.3)		486 (84.2)	91 (15.8)	
26-30	117 (91.4)	11 (8.6)		115 (89.8)	13 (10.2)	
31-35	34 (94.4)	2 (5.6)	0.939	30 (83.3)	6 (16.7)	0.425
Religion						
Christianity	786 (91.9)	69 (8.1)		733 (85.7)	122 (14.3)	
Islam	54 (91.5)	5 (8.5)		49 (83.1)	10 (16.9)	
Traditional	1 (50.0)	1 (50.0)		5 (55.6)	4 (44.4)	
Others[a]	7 (77.8)	2 (22.2)	0.075	2 (100.0)	0 (0.0)	0.070
Ethnicity						
Yoruba	617 (93.2)	45 (6.8)		582 (87.9)	80 (12.1)	
Igbo	144 (88.9)	18 (11.1)		129 (79.6)	33 (20.4)	
Hausa	4 (80.0)	1 (20.0)		4 (80.0)	1 (20.0)	
Others[b]	83 (86.5)	13 (13.5)	0.046	74 (77.1)	22 (22.9)	0.005
Marital status						
Single	826 (91.6)	76 (8.4)		769 (85.2)	133 (14.8)	
Engaged	1 (100.0)	0 (0.0)		1 (100.0)	0 (0.0)	
Married	20 (95.2)	1 (4.8)		18 (85.7)	3 (14.3)	
Divorced	1 (100.0)	0 (0.0)	0.959	1 (100.0)	0 (0.0)	0.971
Highest level of education						
Secondary	196 (92.0)	17 (8.0)		178 (83.6)	35 (16.4)	
Associate degree	70 (95.9)	3 (4.1)		68 (93.2)	5 (6.8)	
Bachelor degree	535 (91.5)	50 (8.5)		498 (85.1)	87 (14.9)	
Masters and above	47 (87.0)	7 (13.0)	0.349	45 (83.3)	9 (16.7)	0.233
Current state of residence						
Southwest	95 (88.8)	12 (11.2)		82 (76.6)	25 (23.4)	
Others[c]	753 (92.1)	65 (7.9)		707 (86.4)	111 (13.6)	

Legend: a Religions that were not included on the survey; b Minority ethnic groups; c States apart from the six in southwestern Nigeria.

Table 4. Practices Towards COVID-19 by Demographic Variables.

Characteristics	Practices, n (%)								
	Going to crowded places			Mask Wearing			Regular Hand Washing		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Gender									
Female	78 (16.1)	407 (83.9)		162(33.4)	323(66.6)		460(94.8)	25(5.2)	
Male	72 (16.4)	368(83.6)	0.908	126(28.6)	314(73.7)	0.118	391(88.9)	49(11.1)	0.001
Age group (years)									
16-20	15(8.2)	169(91.8)		57(31.0)	127(69)		170(92.4)	14(7.6)	
21-25	105(18.2)	472(81.8)		168(29.1)	409(70.9)		527(91.3)	50(8.7)	
26-30	25(19.5)	103(80.5)		49(38.3)	79(61.7)		119(93.0)	9(7.0)	
31-35	5(13.9)	31(86.1)	0.009	14(38.9)	22(61.1)	0.161	35(97.2)	1(2.8)	0.597
Religion									
Christianity	137(16.0)	718(84.0)		268(31.3)	587(68.7)		787(92.0)	68(8.0)	
Islam	12(20.3)	47(79.7)		19(32.2)	40(67.8)		55(93.2)	4(6.8)	
Traditional	1(50.0)	1(50.)		0(0)	2(100)		1(50.0)	1(50.0)	
Others[a]	0(0)	1(100)	0.242	1(11.1)	8(88.9)	0.451	8(88.9)	1(11.1)	0.169
Ethnicity									
Yoruba	112(16.9)	550(83.0)		193(29.2)	469(70.8)		603(91.1)	59(8.9)	
Igbo	22(13.6)	140(86.4)		54(34.2)	104(65.8)		150(92.6)	12(7.4)	
Hausa	1(20)	4(80)		3(60.0)	2(40.0)		5(100)	0(0)	
Others[b]	15(15.6)	81(84.4)	0.766	38(39.6)	58(60.4)	0.082	93(96.9)	3(3.1)	0.225
Marital status									
Single	145(16.1)	756(83.9)		278(30.8)	624(69.2)		829(91.9)	73(8.1)	
Engaged	0(0)	1(100)		1(100)	0(0)		0(0)	1(100)	
Married	5(23.8)	16(76.2)		8(38.1)	13(61.9)		21(100)	0(0)	
Divorced	0(0)	1(100)	0.830	19(100)	0(0)	0.127	1(100)	0(0)	0.009
Highest level of education									
Secondary	29(13.6)	184(86.4)		51(23.9)	162(76.1)		186(87.3)	27(12.7)	
Associate degree	9(12.3)	64(87.7)		27(37.0)	46(63)		70(95.9)	3(4.1)	
Bachelor degree	101(17.3)	484(82.7)		188(32.1)	397(67.9)		543(92.8)	42(7.2)	
Masters and above	11(20.4)	43(79.6)	0.387	22(40.7)	32(59.3)	0.031	52(96.3)	2(3.7)	0.021
Current state of residence									
Southwest	133(16.3)	685(83.7)		252(30.8)	566(69.2)		748(91.4)	70(8.6)	
Others[c]	17(15.9)	90(84.1)		36(33.6)	71(66.4)		103(96.3)	4(3.7)	0.084

Legend: [a]. Religions that were not included on the survey; [b]. Minority ethnic groups; [c]. States apart from the six in southwestern Nigeria.

One of the strong points of this study is its large sample size and the ability to pull such responses during the rapid rise of the COVID-19 virus in Nigeria, especially in the southwest where the majority of the daily new cases were recorded. Our data captured individuals who can be said to belong to the middle-to-high social class as demonstrated by the sociodemographic characteristics of our study. This, in part, may be responsible for the good level of knowledge about COVID-19 among men and women equally.

Due to the nature of the questionnaire, a larger portion of Nigerian young adults may reside in the rural areas where there is limited internet access, and/or some without mobile phones given the modality of the data collection tool. Therefore, our data do not capture the majority in these categories that are more likely to have poor knowledge about COVID-19 and inappropriate attitudes and practices towards preventive strategies. These limitations strengthen the need for further research among these groups of people. Finally, due to the restriction in movement during the period of data collection, which informed the mode of data collection, KAP about COVID-19 may be better assessed through other forms such as key-informant interviews, focused group discussion, among others.

Conclusion

Our study has demonstrated good knowledge of young adults in Nigeria towards COVID-19 and developed a positive attitude and practices towards the preventive strategies necessary to curtail the spread of the virus. Citizens, governments, and agencies can join hands to fight the pandemic as they continue to discover more about the virus and develop positive attitudes and practices towards the prevention of further transmissions. As the pandemic continues to ravage all aspect of human endeavors, government and health related bodies must intensify efforts in order to reach the young adults.

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Original Article

Impact of COVID-19 Lockdown on Depression Severity and the Use of Drugs Among University of Ibadan Students

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Abstract

Background: Since the declaration of COVID-19 as a pandemic, measures such as nationwide lockdowns have been implemented. The sudden disruption of activities coupled with fear could trigger or aggravate mental illnesses and consequently, increase substance use as a coping mechanism. This study then sought to assess the impact of the lockdown on depression and substance use amongst students in a tertiary institution in Ibadan city, Nigeria. **Methods:** A self-administered 26 questions online questionnaire was employed for data collection of socio-demographic characteristics, Patient Health Questionnaire (PHQ-9) to assess depression, and a section on the use of psychoactive drugs during lockdown. Data were statistically analyzed using IBM's SPSS and Microsoft Excel. **Results:** We gathered 102 responses, 54.9% were males. Most of the respondents had mild depression (41.2%), followed by 36.3% that reported not having an episode of depression, 15.7% moderate, 4.9% moderately severe, and 2% severe depression. Female had more depressive episodes than males (p=0.185). Only 4% reported substance use since the pandemic, all were male. At a 95% confidence interval, there was no significant association between the level of depression and any socio-demographic characteristics of students and between the level of depression and drug use. **Conclusions:** According to this study, lockdown and other mitigation strategies implemented during the pandemic were not found to be associated with drug use. A limitation of this study is the cross-sectional design, as a result, a larger multicenter study is needed to ascertain the possible association between lockdown, depressive symptoms, and drug use among students.

Key Words: Depression; COVID-19; Drug Abuse; Mental Health; PHQ-9; Medical students (Source: MeSH-NLM).

Introduction

Coronaviruses are a group of enveloped viruses with a single-stranded, positive-sense RNA genome known to cause respiratory infections such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).[1] In December 2019, a novel coronavirus, SARS-CoV-2 which was first identified as a viral pneumonia of unknown origin was first confirmed in Wuhan, China.[1] Some symptoms of the coronavirus infection include: fever, chills, cough, sore throat, myalgia, nausea, and diarrhea.[2] In January 2020, the World Health Organization (WHO) declared the disease to be an emergency internationally, with regards to public health and thereafter named it a pandemic on 11th March, 2020.[3,4] Therefore, in order to effectively combat this pandemic, governments of countries around the world imposed a compulsory lockdown and cessation of economic activities. These policies have affected the social experience of the populace especially university students with respect to their mental well-being.[5]

A major adverse effect of the COVID-19 pandemic is increased social isolation which is strongly affiliated with anxiety, depression, and drug use.[6] Stringent measures such as lockdown of all schools, restricted movement among other measures, have disrupted daily living for most university students.[7] Early evidence from published studies suggests that COVID-19 is associated with the prevalence of mental and psychological illnesses like depression, anxiety, and post-traumatic stress disorder.[7] Due to this association, the COVID-19 pandemic can be considered a traumatic event.

According to WHO reports, community-based studies revealed an overall prevalence of mental disorders around 25% in several national or cultural contexts.[8] Besides, the abuse of common drugs such as hallucinogens (drugs that affect thought, feeling), nicotine, opioids (drugs that relieve pain), and sedatives have also increased significantly.[9] Depression, having seen to be one of the consequences of substance abuse, is also recognized as a form of mental illness.[10] Recently, studies regarding mental health in relation to the outbreak, were conducted in Asia and focused on specific sub-populations such as college students and medical workers and indicated that the majority of the participants (63.5%) exhibited depressive symptoms in varying degrees.[5] Self-reported depression, anxiety, and suicidal attempts were found to be associated with COVID-19 related issues such as self-isolation, quarantine, misinformation, deaths, and others among health workers and the general public.[11] Besides, the effect of COVID-19 pandemic on benzodiazepine and alcohol abuse – there was an increase in their abuse in some areas while lockdown caused a shortage and reduced access to benzodiazepine and alcohol in some other areas.[12,13]

To the best of our knowledge, there has not been any study to evaluate the relationship between depression and substance use by students due to the COVID-19 lockdown in sub-Saharan Africa. Hence, this study seeks to examine how this pandemic has caused depression and possibly drug abuse among the students at the University of Ibadan. It also aims to test for the relationship between demographic characteristics of students and severity of depression.

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Methods

Study design

The study was a cross-sectional study carried out among the students at the University of Ibadan, Nigeria during the COVID-19 pandemic. Data were collected from July to August 2020.

Population and Sample

The study population comprised of the current undergraduate students at the University of Ibadan with access to smartphones and the internet. About 30,000 students are currently enrolled in the university. All participants were provided with a consent form to either decline or accept to take part in the study. All respondents consented willingly to taking part in the survey. The link to the survey was randomly sent to students at the University through WhatsApp groups for different departments and halls of residence. Also, each co-author shared the link privately with up to 50 contacts eligible for the study.

Data collection instruments

The online questionnaire administered was composed of 26 questions which were divided into three sections which include: sociodemographic characteristics, assessment of depression, and assessment of drug use. Sociodemographic characteristics included data on age range, religion, gender, faculty, and year of study.

The severity of depressive symptoms of the students was assessed through the questionnaire tool, Patient Health Questionnaire (PHQ-9) in English. The PHQ-9 is a self-administered version of the PRIME-MD diagnostic instrument for common mental disorders.[14] The PHQ-9 is the depression module, which scores each of the 9 DSM-IV criteria as '0' (not at all), '1' (several days), '2' (more than half the days), and '3' (nearly every day). It has been validated for use in primary care.[15] The results had been recorded into five severity categories: 0-4 as 'none', 5-9 as 'mild', 10-14 as 'moderate', 15-19 as 'moderately severe', 20-27 as 'severe'.[11] The respondents were asked six questions to assess their drug use during the pandemic.

A pilot survey was initially conducted to test the feasibility and efficiency of the questionnaire and data collected was not included in the study.

Data analysis

The data gathered was saved as Google Sheet then exported to Microsoft Excel package for cleaning and scoring. Descriptive analysis with pie and bar charts was also conducted on Microsoft Excel. Proper tabulation and statistical analysis for Chi-Square test were performed using the Statistical Packages for Social Sciences (SPSS) version 19. A Chi-square test was conducted using SPSS to determine the relationship between depression and socio-demographic characteristics with P-value which indicates whether the relationship is statistically significant. A P-value of, 0.05 at 95% confidence interval was statistically significant.

Results

Sociodemographic

In terms of gender, 56 (54.9%) were males while 46 (45.1%) were females. Most of the participants are young adults within the age group of 19-21 years old (55.9%). Religious backgrounds included Christians (79%), Muslims (20%), and African traditional religion (1.0%). Most of the students were in the 2nd year (35.3%) and 3rd year (34.3%). 51% of participants were in the Faculty of Clinical Sciences while the remaining were spread across 11 other faculties. ***Table 1*** shows the socio-demographic characteristics of participants.

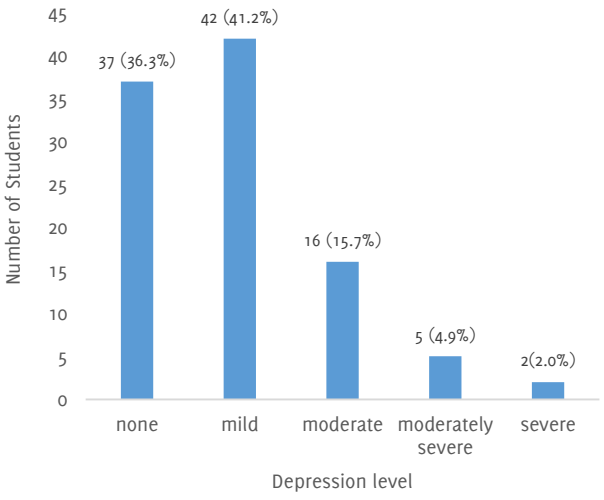
Depression Severity

The level of depression severity found, using the PHQ-9 questionnaire is shown in ***Figure 1***. The comparison of depression severities between male and female students is shown in ***Figure 2*** (p-value=0.185). 44.6% of males and 26.0% of females showed no level of depression. There was no significant association between the level of depression and any socio-demographic characteristics of students (***Table 2***).

Table 1. Descriptive Analysis for Socio-Demographic Statistics.

Study variables	n (%) [n=102]
Gender	
Male	56(54.9)
Female	46(45.1)
Age	
16-18	19(18.6)
19-21	57(55.9)
22-25	21(20.6)
25 and above	5(4.9)
Religion	
African traditional religion	1(1)
Christianity	81(79.4)
Islam	20(19.6)
Faculty	
Agriculture and forestry	8(7.8)
Arts	3(2.9)
Basic medical sciences	9(8.8)
Clinical sciences	52(51)
Dentistry	7(6.9)
Economic and management science	2(2)
Education	2(2)
Law	2(2)
Pharmacy	1(1)
Sciences	6(5.9)
Technology	6(5.9)
The social sciences	4(3.9)
Year of study	
1st	8(7.8)
2nd	36(35.3)
3rd	35(34.3)
4th	17(16.7)
5th	4(3.9)
6th	2(2)

Figure 1. Level of depression among university students



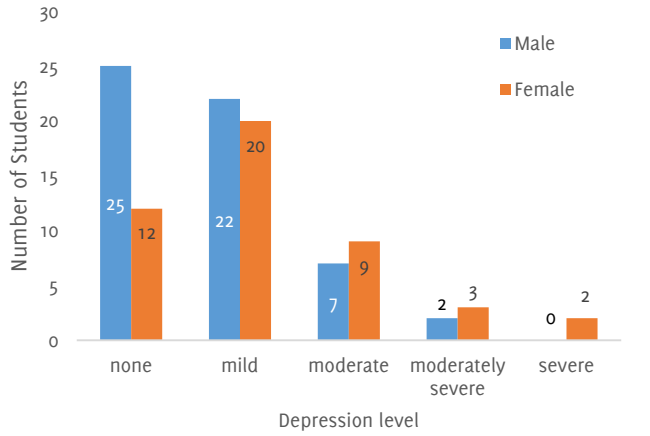
Drug Use

Only 4 (4%) participants responded to have started taking psychoactive drugs only when COVID-19 started, and they were all males. Opioids (tramadol), tobacco, and marijuana were the psychoactive substances used. The drugs were taken for relaxation, sleep stimulants, and boredom. There was no significant association between the level of depression and drug use among the students (P-value = 0.650).

Table 2. Relationship between Depression and Socio-Demographic Characteristics

Characteristics	None [n=37] n (%)	Mild [n=42] n (%)	Moderate [n=16] n (%)	Moderately severe [n=5] n (%)	Severe [n=2] n (%)	*P*-value
Age group						
16-18	7(18.9)	6(14.3)	4(25)	1(20.0)	1(50.0)	0.704
19-21	19(51.4)	24(57.1)	9(56.2)	4(80.0)	1(50.0)	
22-24	7(18.9)	11(26.2)	3(18.8)	0(0.0)	0(0.0)	
25 and above	4(10.8)	1(2.4)	0(0.0)	0(0.0)	0(0.0)	
Gender						
Male	25(67.6)	22(52.4)	7(43.8)	2(40.0)	0(0.0)	0.185
Female	12(32.4)	20(47.6)	9(56.2)	3(60.0)	2(100.0)	
Religion						
Christianity	31(83.8)	35(83.3)	11(68.8)	2(40.0)	2(100.0)	0.310
Islam	6(16.2)	6(14.3)	5(31.2)	3(60.0)	0(0.0)	
African Tradition		1 (2.4)	0(0.0)	0(0.0)	0(0.0)	
Year of study						
1st	2(5.4)	3(7.1)	2(12.5)	1(20.0)	0(0.0)	0.813
2nd	14(67.8)	12(28.6)	7(43.8)	1(20.0)	2(100.0)	
3rd	14(37.8)	14(33.3)	4(25.0)	3(60.0)	0(0.0)	
4th	5(13.5)	10(23.8)	2(12.5)	0(0.0)	0(0.0)	
5th	2(5.4)	1(2.4)	1(6.2)	0(0.0)	0(0.0)	
6th	0(0.0)	2(4.8)	0(0.0)	0(0.0)	0(0.0)	

Figure 2. Comparison between Level of Depression and Gender



Discussion

Overall, University of Ibadan students reported depressive symptoms with a larger portion reporting mild and moderately severe depressive symptoms which may be due to several indoor coping strategies. This is consistent with the study done in Bangladesh.[16] The same is the case with the use of psychoactive drugs; 4.0% of participants recorded that they started using psychoactive drugs such as opioids (tramadol), tobacco, and marijuana during the COVID-19 lockdown. The drugs were taken for relaxation, sleep stimulation, and boredom. Studies have shown that both loneliness and social isolation are associated with decreased cognitive function.[17] There is a possibility that home confinement during the COVID-19 pandemic increased daytime stress, anxiety level, and depression level because most people, including students, are living with changes in their routine, uncertainty about their health, and they cannot participate in vitality giving activities like sport, visiting, friends, and going to religious gatherings.[18-20]

Although not statistically significant, depressive symptoms were higher in female students compared to male students as more females reported moderate, moderately severe, and severe depressive symptoms than male students. This finding correlates with a recent study done in a cohort in Cyprus which showed that women were more likely to have depressive symptoms than men.[21] Depressive symptoms were most prevalent among the 19-21 age groups. One possible explanation for this is that the lower age groups can still afford to be under the protection of their parents or guardians that ensure better decisions on their mental health while those in the 19-21 age group are old enough to make their own decisions about their mental space albeit poorly.[21] A study in Trinidad showed that University students with good religious practices, and who regarded their faith as important, are less likely to have depressive symptoms.[22,23] Unfortunately, due to lockdown the campus religious activities were discontinued which might have contributed to depressive symptoms in some students.

Fear, stress, anxiety, and, in worse case scenarios, depression are all side effects of the lockdown.[24] People living with physical and/or mental health conditions have been found to be more vulnerable to these effects of the lockdown.[24] University students generally comprise a population that experience a high level of psychological distress. Anxiety levels and depression are likely to increase during the lockdown characterized by social distance, isolation, and quarantine. Seeing that their daily routines and activities are disrupted, boredom and sleep problems would not be far-fetched. Increased alcohol consumption, smoking, and abuse of psychoactive substances are likely side effects of the lockdown on this population.[25]

Medications, binge-watching TV series, surfing the internet, watching pornography, and few other things have been suggested to relieve stress and shun difficult thoughts.[26-29] Use of these substances as well as engaging in the activities are some of the possible social behaviors to alleviate mental stress of the lockdown and pandemic. Nevertheless, there remains a high tendency that they may advance into habits which are quite difficult to break.[30-31]

Alcohol and other psychoactive drugs interfere with the nervous system and they are ingested at alarming rates by people avoiding difficult thoughts, unpleasant emotions, anxiety, and stress.[33-35] It was suggested that alcohol is the most used psychoactive substance after caffeine; followed by smoking tobacco and lastly recreational drugs.[36]

Psychoactive substances like opioids (e.g. tramadol), tobacco, and marijuana were found to be consumed by the participants. Although the level of depression and drug use among students did not have an association that is statistically significant (P-value >0.05), 4% of the participants started taking psychoactive substances during the lockdown.

Besides, although the mental health of the entire populace might be affected by the pandemic, the marginalized populations may have a higher risk due to a larger number of daily stressors and an even larger strain on resources.[37]

Limitations

There were some limitations and challenges encountered in the study which included the method of data collection, that is, online data collection which was employed primarily due to lockdown. Only eligible participants with access to a mobile phone or the internet could participate, potentially affecting the generalizability of the results. Also, there is a risk of selection and information bias due to the online data collection method. Besides, the low reported number of drug use may be because respondents already started taking psychoactive substances before the lockdown. Also, the study was conducted only in one University, hence, the external validity is limited, and the result may not apply to the general population because of the small sample size. Lastly, we could not ascertain background psychiatric conditions in participants.

Conclusion

The level of depression among the study participants was high and not associated with gender. However, the severity was minimal. Government and stakeholders should consider the impact of lockdown and other mitigating strategies for reducing the transmission of COVID-19 and future public health emergencies on the mental health of youths and the general population while making policies. A multicentered study would be necessary to assess the incidence as well as the severity of depression on a larger scale. We also suggest that this study should be replicated among the marginalized populations.

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Original Article

Prevalence of Psychological Distress Among Quarantined People in the Trivandrum District During the COVID-19 Pandemic: A Cross-sectional Study

Sneha S Prakash,[1] Sneha Sabu,[1] Jayaprakash Raghavan,[2] Chintha Sujatha.[3]

Abstract

Background: Quarantine is considered the most effective way to reduce the transmission of an infectious disease. The outbreak of coronavirus disease-19 (COVID-19) in 2020 led to many people being quarantined at various locations. The literature shows that people who undergo quarantine face psychological problems, such as depression, anxiety and stress. The aim of this study was to estimate the prevalence of psychological issues among quarantined people during the COVID-19 pandemic. **Methods:** This cross-sectional study was conducted in Trivandrum, Kerala, India. Adults aged 18 years and above who underwent quarantine in the area of the Pangappara Medical Health Centre were included. A semi-structured questionnaire and the Depression Anxiety Stress Scale-21 were administered to those who had given their informed consent. Quantitative variables were summarized using mean, standard deviation, and categorical variables with proportions. Significance of association was tested using the chi-square tests. **Results:** There were 143 participants included in the study. It was found that 23.8% had depressive symptoms, 14% had anxiety symptoms and 16.8% had significant stress. People from the age group of 26-40 years ($p = 0.017$), people from the higher educated group ($p = 0.010$) and non-resident Keralites (Keralites who were residing elsewhere and returned to Kerala during the pandemic) ($p = 0.041$) had the highest prevalence of depressive symptoms. **Conclusion:** People who undergo quarantine face many psychological issues. The health care system should provide adequate psychosocial support to quarantined people suffering from psychological problems. Health care workers should undergo appropriate training to provide these supports.

Key Words: Coronavirus Disease; COVID-19; Quarantine; Depression; Anxiety; Stress (Source: MeSH-NLM).

Introduction

The coronavirus disease (COVID-19) pandemic that started in China was declared a public health emergency of international concern by the World Health Organization (WHO) on 30 January 2020.[1] On 11 March 2020, it was subsequently declared a pandemic.[2] The first case of COVID-19 in India was reported in the southern state of Kerala on 30th January 2020.[3] The number of cases has been increasing ever since. Transmission of infectious diseases is often controlled by quarantine and isolation of the population at risk.[4]

Quarantine is the separation and restriction of people who have potentially been exposed to a contagious disease to ascertain if they become unwell so as to reduce the risk of them infecting others.[5] The term 'quarantine' was first used in Venice, Italy, in 1127 with regard to the spread of leprosy and was widely used during the period of the Black Death in England.[6] In the case of the COVID-19 pandemic, the WHO issued quarantine guidelines on 29 February 2020.[7] Previous studies have shown that implementing strict quarantine measures can precipitate various psychological problems, such as panic disorder, anxiety disorder and depression.[8] Other negative psychological issues that may be triggered by quarantines include post-traumatic stress symptoms, confusion and anger.[9] A study conducted among Chinese university students during the COVID-19 outbreak also reports that mandatory quarantine is significantly associated with emotional distress.[10] According to *Hawryluck et.al*, symptoms of post-traumatic stress disorder and depression were observed in 28.9% and 31.2% of people quarantined during the Severe Acute Respiratory Syndrome (SARS) epidemic.[11]

Several studies have investigated the psychological impact of pandemics and the lockdown that follows on the general population, as well as among healthcare workers.[12–21] The quarantined population differs from the general population in that they had to follow a strict protocol and stay in isolation due to the risk of probable exposure to the disease. According to the guidelines issued by the Ministry of Health and Family Welfare, Government of Kerala, the people coming from outside countries, from states outside Kerala, and those who had primary contact with people who tested positive for COVID-19 were required to spend 14 days at home or an institutional quarantine facility.[22] There are only limited studies, especially in an Indian setting, investigating the extent and prevalence of psychological issues among those who were quarantined. These psychological issues include depression, anxiety and stress. Thus, this study aims to better understand these psychological issues and their relationship with factors such as age and educational status to help formulate better policies to improve population mental health during this period.

The primary objective of this study is to estimate the prevalence of psychological issues such as symptoms of depression, anxiety and stress among quarantined people in the Trivandrum district during the COVID-19 pandemic. The secondary objective is to assess associations of psychological issues during a quarantine with socio-demographic factors.

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Methods

A cross-sectional study was done in the area of Pangappara Medical Health Centre Unit, in the Trivandrum district, India. Trivandrum district is the capital city of Kerala, India with a mostly urban population.

The study population included all adults who had undergone quarantine in the Trivandrum district during the COVID-19 pandemic, were classified under the Pangappara Medical Health Centre Unit, could be contacted over the phone and consented to participate in the study. The data was collected between July 2020 and September 2020 through telephone interviews. The data was collected from individuals who had completed their quarantine in the past 7 days and had consented to participate in the study. The study was started only after obtaining permission and ethical approval from the health authorities and clearance from the Institutional Ethics Committee (HEC No. 03/51/2020/MCT). The list containing the details of the people under quarantine in the district, under the Pangappara Medical Health Centre Unit, was obtained from the Administrative Medical Officer. Those quarantined individuals in the list who were aged 18 years and above and had given their informed consent constituted the study participants. These study participants were contacted over the phone and invited to participate in the study. The participants gave their informed consent after learning about the procedure and objectives of the study. They were assured that they would not have any financial burden due to participating in the study, that they could withdraw from it at any time they wanted and that none of their personal details would be published or misused in any way.

Inclusion criteria included all persons aged 18 years and above who had undergone quarantine in Trivandrum district during the COVID-19 pandemic.

The study tools used to measure psychological illness, sociodemographic factors and medical comorbidities included the Depression and Anxiety Stress Scale (DASS-21)[23] as well as a semi-structured questionnaire. The semi-structured questionnaire was used to collect relevant information regarding the socio-demographic factors as well as comorbidities. The socio-demographic factors investigated included variables such as age, sex, educational status, occupational status and resident status. Non-resident Keralites include Non-Resident Indians (NRIs) as well as Keralites who had been residing in other states and returned to Kerala during the time of the pandemic. Resident Keralites denote the native residents of Kerala and non-Keralites residing in Kerala refer to the natives of other states who were residing in Kerala during the pandemic period. The DASS-21 is a symptom-analysis scale and contains 21 questions, seven questions each for Depression, Anxiety and Stress.[23] Each question is graded on a 4-point Likert scale and the scores range from 0 to 3. To calculate the total score for each condition, the scores of relevant questions were added together and the value obtained was multiplied by 2 as per the description in the tool manual. The scores obtained for each question in the DASS-21 questionnaire were added as per the guidelines given in the DASS score sheet to obtain the total scores for depression, anxiety and stress.[23] The cut-off scores given in the tool manual to categorize as Depression, Anxiety and Stress were at 9, 7 and 14, respectively. This tool has been validated in the regional setting and used for other Indian studies.[18]

Statistical Analysis and Sample Size Calculation:

According to *Hawryluck et al.* the prevalence of post-traumatic stress disorder among quarantined people is 28.9%.[11] Using this value in the equation $3.84 * pq/d2$, the sample size is calculated as (as suggested by a statistician): p = 29, q = 71, Absolute precision d = 25% of p = 8. Sample size = $3.84 * pq/d2$ = 124. Therefore, the target sample size was set at 130 to be conservative.

The sociodemographic data and the DASS-21 scores collected were entered in a Microsoft Excel spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS) Version 25.0 for Windows. Quantitative variables were summarized in means and standard deviations while categorical variables were summarized as proportions. Significance of association was tested using Chi-square tests ($p<0.05$).

Results

There were approximately 250 people in the list and 204 were over the age of 18. Seventeen calls could not be connected because either the phones were switched off or they were out of network coverage area and 18 persons did not attend the call. Out of the remaining 169, 143 individuals gave consent to participate in the study.

The study population was composed of 143 adults, of which 96 (67.1%) were males, and 47 (32.9%) were females, with ages ranging from 18 to 72, the mean age being 36.28. The socio-demographic characteristics of the study population are shown in ***Table 1***. The main socio-demographic characteristics that were assessed included gender, age, educational status, occupation and place of residence. All of the 143 adults included in the study were quarantined at their respective homes except one person, who was under institutional quarantine.

Nearly about one-fourth of the study population, 34 out of 143 (23.8%), were found to have depressive symptoms; 20 out of 143 (14%) were found to have symptoms of anxiety; and 24 out of 143 (16.8%) were found to have symptoms of stress as per DASS-21. Associations of socio-demographic factors with depression, anxiety, and stress are shown in ***Table 2***. Among these factors, age group (in years) (p=0.017), education status (p=0.010) and place of residence (i.e., Resident Status) (p=0.041) showed statistically significant associations with depressive symptoms. None of the studied variables were significantly associated with anxiety symptoms. Only education status (p=0.005) was significantly associated with stress (***Table 2***)

Table 1. Socio-demographic characteristics of the study population (n = 143).

Socio-demographic Variables	Frequency n (%)
Gender	
Male	96 (67.1)
Female	47 (32.9)
Age Groups (in years)	
18-25	24 (16.8)
26-40	75 (52.4)
41-65	42 (29.4)
>65	2 (1.4)
Education	
Pre-degree and below	31 (21.7)
Degree and above	112 (78.3)
Occupation	
Professionals and skilled workers	103 (72.0)
Unskilled workers	11 (7.7)
Students	12 (8.4)
None	17 (11.9)
Place of Residence (Resident Status)	
Non-Resident Keralites	83 (58.0)
Resident Keralites	49 (34.3)
Non-Keralites residing in Kerala	11 (7.7)

Legend: Non-resident Keralites include non-resident Indians (NRIs) as well as Keralites who had been residing in other states and returned to Kerala during the time of the pandemic, resident Keralites denote the native residents of Kerala and non-Keralites residing in Kerala refer to the natives of other states who were residing in Kerala during the pandemic period. The category 'Pre-degree and below' in education includes people who have received formal education only up to Grade 12 or below. The category 'degree and above' includes people who have completed formal school education and are either pursuing or have received a college degree.

Discussion

Among the study population, it was found that 23.8% had depressive symptoms, 14% had anxiety symptoms and 16.8% symptoms of significant stress as per DASS-21. People aged 26 to 40 years had the highest prevalence of depressive symptoms, followed by the 18 to 25 years' age group. Regarding educational status, a higher proportion of people from the higher educated group were found to have depressive symptoms when compared with the group that had a lower educational status. Stress followed the same pattern of association and was significantly associated with higher educational status. Regarding resident status, a higher prevalence of depressive symptoms was found among Non-Resident Keralites.

In a study conducted in West Bengal, *Chakraborthy et al.* found that the prevalence of depression among the general population due to lockdown was 24.7%.[12] Another study conducted in India found the prevalence of depression to be 25%, anxiety 28% and stress 11.6% among the general population during the COVID-19 pandemic.[18] Our study differs from those studies since they were conducted among the general public, while our study was specifically conducted among a group of people under quarantine. The quarantined population differs from the general population in that the quarantined population was more likely to be exposed to infection (in order to be forced to quarantine) and thus had to observe strict social distancing norms and other practices like handwashing and the use of face masks.

The findings obtained in our study correlate with many other studies which had revealed that pandemics put great pressure on the mental health of the general population. Many of these studies have used the same scale as we used (DASS-21).[18] As stated earlier, *Hawryluck et al.* found similar findings among quarantined persons during the SARS epidemic.[11] Another study conducted in Hong Kong among survivors of SARS found that 10% to 18% reported symptoms related to PTSD, anxiety and depression.[24] In a study among the Ebola survivors and healthcare workers during the 2014-15 Ebola outbreak in Sierra Leone, the survivors had a higher prevalence of depression, anxiety and several other psychological disorders.[25]

The results obtained in the present study can be attributed to the quick spread of the pandemic across the world, which resulted in many people returning to their homes and native lands. Then, they found that they had to spend a certain number of days in quarantine and had to stay in their homes even after their quarantine periods were over. Moreover, most recreational activities such as traveling, meeting people and social gatherings were not possible. The importance of social groups in providing support has been studied in detail by groups such as *Felton et.al.*[26] Moreover, while still in quarantine, people had to adjust to their 'new normal' way of life that included more video calls, online meetings, online classes and work-from-home. Above all, the fear of an unknown disease that was quickly spreading everywhere, the day by day increase in the number of cases and misinformation regarding various aspects of the disease could have contributed to the general increase in the prevalence of depression, anxiety, and stress among the quarantined population. Chakraborthy et al., in their study, had found that a significant proportion of the population was preoccupied with the idea of getting infected.[12] Some of the participants in our study also reported that they felt uncomfortable due to the social stigma attached to being in quarantine and that they had to face negative comments from their neighbors concerning this stigma.

The higher prevalence of depressive symptoms among the younger age groups in the present study may be because of the restrictions that the quarantine had imposed upon them, right in their prime productive age. This included restrictions on social mobility and their usual pursuits of recreation like meeting with their social circle and traveling.

Table 2. Associations of Socio-Demographic Factors with Depression, Anxiety, and Stress (n = 143).

Socio-demographic Variables	Depression Present n (%)	p-value	Anxiety Present n (%)	p-value	Stress Present n (%)	p-value
Gender						
Males	22 (22.9)	0.73	12 (12.5)	0.464	16 (16.7)	0.957
Females	12 (25.5)		8 (17.0)		8 (17.0)	
Age Groups (in years)						
18-25	7 (29.2)	0.017	5 (20.8)	0.369	6 (25.0)	0.071
26-40	24 (32.0)		12 (16.0)		16 (21.3)	
41-65	3 (7.1)		3 (7.1)		2 (4.8)	
>65	0 (0)		0 (0)		0 (0)	
Education						
Predegree and below	2 (6.5)	0.01	2 (6.5)	0.172	0 (0.0)	0.005
Degree and above	32 (28.6)		18 (16.1)		24 (21.4)	
Occupation						
Professionals and skilled workers	25 (24.3)	0.051	14 (13.6)	0.18	17 (16.5)	0.205
Unskilled workers	2 (18.2)		1 (9.1)		0 (0.0)	
Students	6 (50.0)		4 (33.3)		4 (33.3)	
None (Unemployed)	1 (5.9)		1 (5.9)		3 (17.6)	
Place of residence (Resident Status)						
Non-resident Keralites	26 (31.3)	0.041	14 (16.9)	0.503	19 (22.9)	0.051
Resident Keralites	6 (12.2)		5 (10.2)		5 (10.2)	
Non-Keralites residing in Kerala	2 (18.2)		1 (9.1)		0 (0.0)	

Legend: Non-resident Keralites include non-resident Indians (NRIs) as well as Keralites who had been residing in other states and returned to Kerala during the time of the pandemic. Resident Keralites denote the native residents of Kerala and non-Keralites residing in Kerala refer to the natives of other states who were residing in Kerala during the pandemic period.
The category Predegree and below in education includes people who have received formal education only up to Class 12 of school or below. The category Degree and above includes people who have completed formal school education and are either pursuing or have received a college degree.

Another study also reported that younger age groups, especially the 18-24 years' age group and the 25-35 years' age group, had a more negative psychological impact when compared with the rest of the population. In comparison, the ones above 65 years of age had the least psychological impact.[14] Moreover, most of these participants were home-quarantined and had a fear of infecting family members who might be more vulnerable. Many people, especially those belonging to the 26 to 40 years' age group, had worries regarding the safety of their families, especially their elderly parents and young children. In support of this finding, a study conducted in Wuhan by *Zhu et al.* reported that living with family and worries about family members getting infected were risk factors for psychological problems among healthcare workers during the beginning of the COVID-19 pandemic.[20]

This study also found that a higher proportion of people among the group with higher education had depressive symptoms and stress. This could be because they were more aware of the risks and chances of contracting the infection. They were possibly also more aware of the ongoing research on the long-term complications that might arise due to COVID-19; hence, they had more worry than their counterparts from the group that had less education. On the other hand, the participants were not being diagnosed by a healthcare provider but were answering questions over the phone. Therefore, perhaps, people with lower education status were more prone to reporting bias or there may have been a knowledge gap, which led to this finding.
The higher prevalence of depressive symptoms among Non-Resident Keralites could be attributed to their worries regarding the loss of their jobs and livelihood, fear of infecting their family members, the difficulties of getting accustomed to work-from-home, and other such concepts. Some of the study participants also reported that they were sad that they could not see their family and friends from their hometowns. However, they understood the reason and necessity of the quarantine process. This could also have contributed to a higher prevalence of depressive symptoms among this group.

A limitation of this study was that it was conducted by interviewing the study participants over the phone, which might not yield results with the same accuracy as self-reporting or a face-to-face interview. Other limitations such as selection bias, interviewer bias and report bias may also have affected the outcome of the study. In addition, as this was a cross-sectional study, we can only infer correlation and not causation from these results, and a clear conclusion cannot be clearly stated because of the possibility of confounders altering the levels of psychological distress in the study population.

Conclusion

The present study has concluded that a considerable group of people who had undergone quarantine faced psychological problems like depressive symptoms, anxiety symptoms and stress. This issue needs to be addressed since it demonstrates that the mental health of quarantined individuals can differ from the general population based on unique challenges and may need to be approached from a different perspective. This can be done by reaching out to these individuals and providing adequate psychological support and counseling services. Moreover, primary healthcare workers should be trained to identify and address the mental health issues of quarantined people and offer necessary support and services. The services that have already been launched by the Government of Kerala to provide mental health support such as telecounselling services namely, "Ottakkalla Oppamund" (translated as "You're not alone, we are with you"), need to be strengthened. As the authors, we feel that family members and the general public should be made aware of the psychological impacts of quarantine and they could benefit from their constant love and support.

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Original Article

The Pandemic Leadership Model: A Study of Medical Student Values During COVID-19

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Abstract

Background: Leadership training in medical school continues to grow. Little information exists to guide leadership program development. Concurrently, the COVID-19 pandemic provides a real-world crucible of leadership, allowing insight into qualities and characteristics medical students value. We aim to determine what students value in leadership during a pandemic and the implicit framework students use. **Methods:** We conducted a cross-sectional, qualitative study using a five-item novel survey instrument developed by a consensus group of experts from family medicine, leadership development, medical education, and survey research to elicit student perceptions of effective and ineffective leadership qualities and examples during the COVID-19 pandemic at the University of Michigan Medical School. We used thematic analysis to identify overarching themes to build a model of leadership integrated with existing theory. **Results:** 162 students participated across all years of medical school. We identified themes of Communication, Other-Orientation, Personal Characteristics, Decisive Action, and Use of Information. These five themes were then built into the model of Pandemic Leadership within the context of complexity leadership theory and collective leadership theory. This model represents qualities and characteristics students value in good leaders during a crisis. **Conclusion:** This study is unique in its focus on student perceptions of leadership qualities during a real-world laboratory for leadership. We hope that this information, along with the pandemic leadership model, can serve as the first step toward relevant leadership training programs in medical education. Leadership training programs in medical education would likely benefit from grounding in the student values identified by this study.

Key Words: Leadership; Medical Education; Pandemic (Source: MeSH-NLM).

Introduction

Today's medical school graduates face a rapidly changing practice environment. From decreasing physician autonomy, to increasing interprofessional collaborative care, to unprecedented public health challenges like the COVID-19 pandemic, the challenges of practicing physicians continue to grow.[1] This requires a corresponding broadening of undergraduate medical education (UME) to face these novel challenges.

One critical factor required for a medical system to successfully adapt to rapid change is the presence of effective leaders. Leadership has been shown to be important in many medical contexts, with physicians' engagement in hospital leadership and management improving clinical outcomes and performance.[2,3] Medical education curricula require a corresponding plan to prepare graduates to take on these leadership roles. While many studies have evaluated leadership development in graduate medical education and continuing medical education, there is a relative dearth of information surrounding training programs for UME.[1,4-6] As such, medical students currently feel uninformed and unprepared about leadership and managerial roles within medicine and may face challenges navigating power dynamics within medicine.[7-8]

It is also crucial to ground training of medical students within relevant leadership theory.[9-10] Upon review of existing structures, two relevant leadership frameworks were identified, called Complexity Leadership and Shared/Collective/Distributive Leadership. Within these frameworks, leadership is seen as a complex system of interaction agents with unpredictable feedback networks which, in turn, output responsive results such as information-sharing, invention, and continued evolution to change.[11-13] Complexity and Shared Leadership provide an ideal framework for the interdependent relationships and dynamism of the medical field. These structures are also well-suited to examine the responses to the current global pandemic.

Additionally, little standard information exists about ideal leadership models or frameworks to shape program creation.[14] In the UK, in order to shape curriculum development in leadership education, the National Health Service developed the "Medical Leadership Competency Framework", followed by the Healthcare Leadership Model.[15-17] These leadership frameworks emphasize the need for quality improvement (QI) projects organized by students and increased use of simulation. Similarly, the accreditation body for Australian medical schools recommend medical leadership teaching and assessment but falls short of suggesting specific curricula for medical schools.[18,19] Undergraduate medical education in the United States may benefit from a similar model, grounded in student understanding of leadership competencies. As a result of unclear standards and student values, current programs are highly varied, ranging from opt-in summer programs to longitudinal diversity training.[20-22]

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Although a recognized unmet need in UME, little literature exists on the values students require in leadership. There is a clear gap in the understanding of the implicit model of leadership that students hold and the values they look for in leaders. The current global pandemic brought to light the importance of leadership in medicine. The objective of this study is to determine, through qualitative survey, the values that medical students at the University of Michigan Medical School hold for leadership during a pandemic, in order to inform the further development of medical education curricula. Additionally, in order to place the results within context of leadership theory, we aim to determine a model for pandemic leadership from the perspective of medical student values.

Methods

Study Design

We conducted a cross-sectional, qualitative study of medical students at the University of Michigan Medical School. Survey results were anonymous and all responses were collected within seven days. All aspects of the study were approved by the University of Michigan Medical School's institutional review board (HUM00179411).

Setting

Our study took place at the University of Michigan Medical School. Students in all classes were invited to participate in the survey with a single email in April 2020, during a period when students were removed from the clinical setting and were taking an online "Pandemic Medicine" course.

Participants

Our survey was sent to medical students in all four classes. Each class comprises approximately 160 students, with a subset participating in dual degree programs such as MD/MBA or MD/MPH programs. All students at the University of Michigan Medical School were eligible to participate. Each participant received an anonymized individual link that was only accessible from an email address associated with medical school students to ensure no ineligible responses. To prevent duplicate responses, each link only allowed one response. Non-students were excluded as the survey was only sent to and accessible from a medical school email address. The first screen of the survey was an informed consent page, giving detail about the risk, benefit, and purpose of study. Participants were able to agree or decline participation in the study without consequences.

Variables/Measurement

The survey instrument was developed by a consensus group of experts from family medicine, leadership development, medical education, and survey research. The survey included five free-text questions assessing student perceptions of exemplary and poor leadership qualities. The full survey questions are shown in ***Table 1***. The survey was administered via an online platform (Qualtrics, Provo, Utah).[23]

Bias

In order to reduce bias in data collection and analysis, survey responses were anonymous. Each reviewer also followed the 15-point checklist of good thematic analysis presented by Clarke and Braun,[24] including generating codes and themes independently before undergoing intercoder agreement exercises. We additionally performed a participant pilot with six representative students across multiple class years to ensure ease of survey understandability and identify any potential issues in survey design that may have led to bias.

Study Size

Our study intended to gather a sample of student opinions from all four classes. The survey was sent to each classes' email list serve at the University of Michigan Medical School, reaching approximately 640 students. To ensure thematic saturation in our qualitative analysis, we aimed to collect information from 25% of all students (~160 participants).

Table 1. Free Response and Demographic Questions Surrounding Students' Views of Good and Poor Leaders in a Pandemic at the University of Michigan Medical School.

Question	*Answer Method*
What are some examples of good leadership that you have seen or experienced at any level (from your peers or class representatives through national/international leaders) during the COVID19 pandemic? Please be as specific as possible.	Free text
What do you think are the most beneficial or effective qualities/behaviors of leaders during a crisis like the current COVID19 pandemic? Please explain why.	Free text
What do you think are the most detrimental or ineffective qualities/behaviors of leaders during a crisis like the current COVID19 pandemic? Please explain why.	Free text
What, if anything, are you learning about others from observing their reactions or behavior during this time (including peers, friends, family, leaders)?	Free text
What, if anything, are you learning about yourself during this time?	Free text
What is your current phase of training?	Multiple Choice
How do you describe your gender identity? (Mark all that apply)	Multiple choice
Please select your age below	Multiple choice

Qualitative Analysis

To analyze the survey responses, we used a thematic analysis approach, following the 6 phases described by Braun and Clarke.[25,26] The 6 phases are: "1. Familiarizing yourself with your data; 2. Generating initial codes; 3. Searching for themes; 4. Reviewing themes; 5. Definite and naming themes; 6. Producing the report."

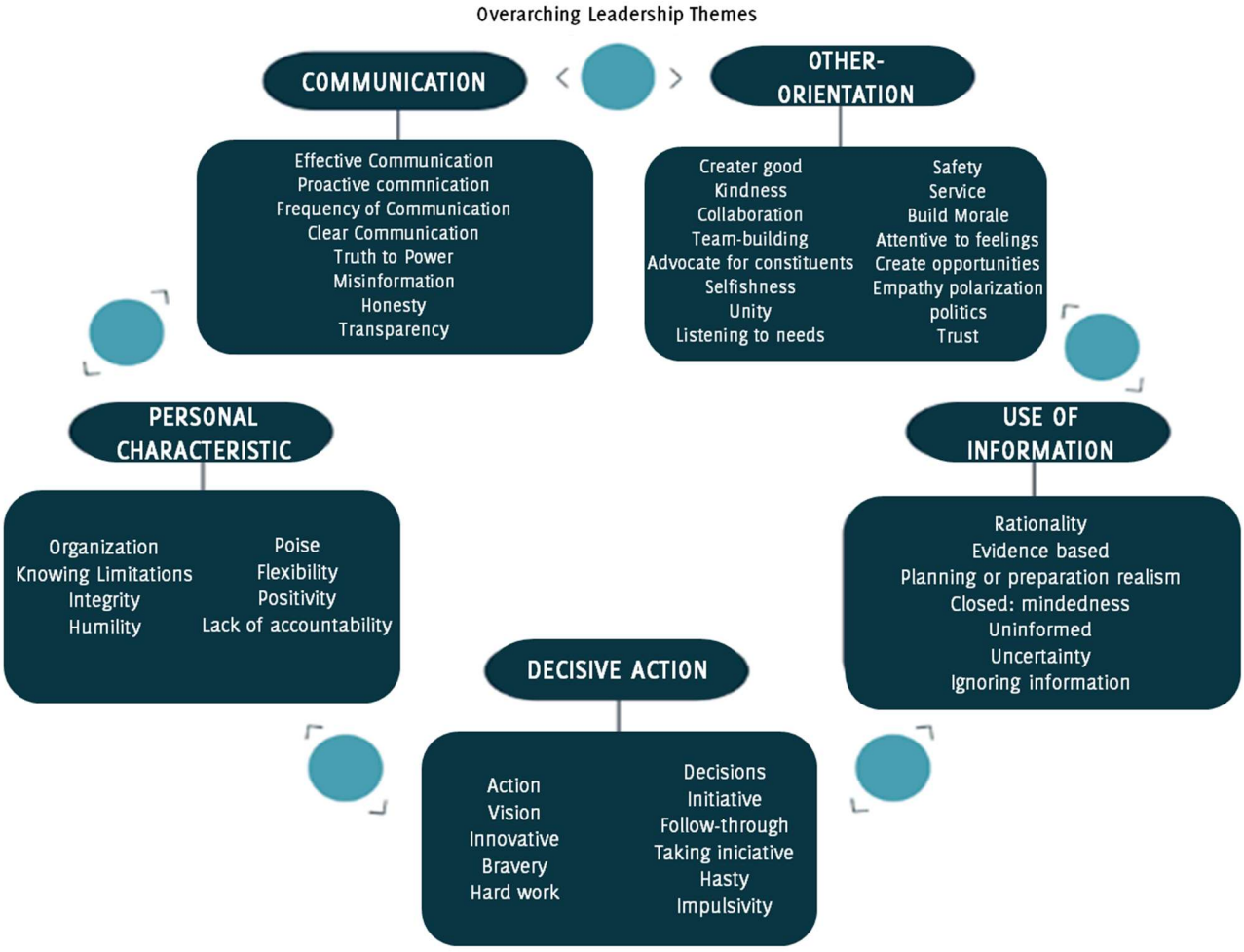
Specifically, we followed the following analysis process: Two authors (AB, SO) independently read the entire data set to familiarize themselves with the scope of the content. They recorded initial ideas and notes about possible future themes and codes. Then, four authors (AB, NK, EKJ, and SO) independently performed a line-by-line reading, and re-reading, of the first 20% of the responses. Each author produced a set of initial codes from the data.[24] The coders then underwent intercoder agreement exercises. Any coding disagreements were discussed between the coders until all coders agreed on a complete set of codes. Each coder then analyzed an additional 20% of the responses and one coder re-analyzed the initial 20% with the updated codes to ensure every response was reviewed by multiple authors in the analysis process.

Initial codes were then combined into common categories, which were then clustered to form overarching themes. This process was iterative and involved many re-readings of each section, refocusing analysis on broader levels of themes. Themes were evaluated based on the extent to which the theme captured sentiments expressed in the entire data set and encompassed codes. These themes were then reviewed by four authors and inter-coder agreement was achieved for all five themes. Themes were reviewed to ensure there was sufficient supporting data for each and that they are distinct from each other.[25] After ensuring the codes and underlying data are accurately represented by the themes, a candidate "thematic map" was developed (***Figure 1***) to indicate the interrelationships among themes.

Reflexivity Statement

This research is based in the University of Michigan Medical School, where the first two of the authors are students. The remaining authors are faculty at this institution. In addition, the lead author has a background in teaching and developing leadership curricula for outdoor education and wilderness programs. Answers to the survey questions addressed leadership both within and outside of the University of Michigan.

Figure 1. Leadership Themes Identified with Corresponding Sub-Codes from Response Data of Students at the University of Michigan Medical School.



Results

In total, of approximately 640 eligible students attending the University of Michigan Medical School, 162 students participated in the survey. ***Table 2*** displays the demographic characteristics of participants. Overall, 96 (59% of) study participants were female, and 62 (38%) were male. An additional 1 respondent identified as transgender or nonbinary, and 3 (2% of) respondents left this item blank. The median age was 25 (range, 22-39 years old), with broad representation from the four medical school classes with 32-49 (20-30%) from each year and 8 (5% of) respondents from dual degree participation. Specific reasons for non-participation were not assessed.

Table 2. Sociodemographic information for survey respondents.

Demographic Characteristics	Number	Percentage
Total	162	100%
Scientific Trunk (M1)	32	20%
Clinical Trunk (M2)	33	21%
Early Branches (M3)	49	30%
Graduating Branches (M4)	38	24%
Dual Degree/MSTP	8	5%
Female Students	96	59%
Male Students	62	38%
Other/Not listed	4	2%

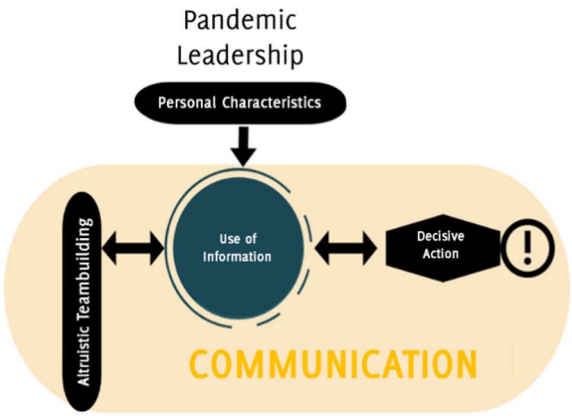
Initial analysis of themes identified five overarching concepts related to leadership in a crisis, with corresponding sub-codes. ***Figure 1*** illustrates the major leadership themes that were identified: communication, other-orientation, use of information, personal characteristics, and decisive action, with the corresponding codes used in analysis.

The initial concept map with the above themes and codes was then revised into the pandemic leadership model, reflecting the interrelationships between the student themes (***Figure 2***). This model was compared with the codes and original data to ensure consistency and that it fully captured student perspectives. The use of the model and its relation to existing theory is explained in detail with further supporting responses in ***Supplemental Appendix 1***.

Sample responses and description of themes: Personal Characteristics: Students referred to several interpersonal and character traits displayed by good leaders. "Effective leaders act with humility, integrity, and respect; they are willing to learn what they don't already know about the situation, and willing to take feedback from those who are most impacted/who are not in leadership positions." – 26-year-old female, Dual Degree Student.

Communication: Study participants repeatedly described the essential nature of clear and consistent communication in pandemic leadership as well as its relationship to decisive action. Conversely, examples of ineffective communication were explained when discussing poor

Figure 2. The Pandemic Leadership Model was Derived from Student Perspectives of Leadership at the University of Michigan Medical School During the COVID-19 Pandemic.



leadership. "regular communication - people are especially hungry for information so communicating well can help to dispel fear" and that "the unknown scares people. Sharing as much information as possible helps morale…" -27-year-old female, Early Branch student (M3).

Other-orientation: This theme relates to both the ways leaders approach their communities and to building positive and effective teams. "A collaborative spirit is absolutely necessary to solve problems in real-time that we have never faced before" – 24-year-old female, Early Branches student (M3)

Decisive Action: The theme of taking initiative and bravery in decisions was central to students' descriptions of good leaders in a crisis. **"**Great communication, thoughtful and decisive action, and willingness to get to work. I think all of these behaviors put the entire community at ease, and instill a certain sense of trust" -26-year-old male, Late Branches Student (M4)."

Use of Information: This central theme in the model of pandemic leaders refers to the gathering, use, and dissemination of information in crisis. "Good leaders spend more time listening to others than talking themselves, because it's critical to be as fully informed as possible before making decisions." -31-year-old male, Late Branch Student (M4).

Discussion

This study aimed to uncover the values that medical students desire from their leaders in the context of the current pandemic. Through qualitative approaches, five key themes were identified. The overarching values from the responses were examined through existing frameworks of leadership theory with a focus on Complexity Leadership theory and Shared/Collective Leadership for the purpose of informing medical school leadership curricula.

The theme of use of information arose in in the context of what makes a good leader and is central to the model of excellent leadership according to medical students. This relates directly to the theory of Collective Leadership, where leadership exists as a system of connected networks.[26] These ideas parallel directly to student comments surrounding pandemic leadership. Leaders must know how to gather information involving planning and use evidence-based information to distribute the truth to the public. Students stated that good leaders use data and evidence to make their decisions. Respondents stressed the importance of grounding in realism and rationality in good leaders. This theme relates to current leadership curriculum at the University of Michigan Medical School and the recent emphasis on evidence-based medicine in both clinical practice and training. This finding suggests that continued evidence-based medicine training and additional education in information digestion and synthesis is appropriate for inclusion in leadership training curricula.

The theme of "Other-orientation" was supported by many students' comments. Other orientation refers to the ways in which leaders act in relation to those they lead or their communities at large. Students endorsed the need to be working toward the greater good, acting in service of others, and creating opportunities – labeled broadly as team building. Medical education has more recently been moving past the traditional emphasis on management of illness, with more weight being placed on team collaboration and interprofessional training,[27] directly supporting this expressed student value. At University of Michigan Medical School, this concept in leadership is taught through an exercise called the Leadership 360-degree evaluation, where feedback is solicited from evaluators from many different contexts and roles. This helps students to better understand the roles they play and their relationships to other aspects of the education and medical systems in which they interact.

Another major theme was that consistent communication is essential for good leaders. This finding serves as additional support for the recent push among undergraduate medical educators to include communication and interpersonal skills at all levels of medical training.[28,29] This leadership theme is specifically taught at the University of Michigan Medical School with presentation and speaking skills sessions, teambuilding lessons, and training in challenging conversations.

Students described in detail the need for leaders to take decisive action in a crisis. Leaders must take initiative and follow through on their vision. Decisive action taken by leadership at the medical school level, both by other students and by administration, were aimed at responding to the crisis and creating new opportunities for people to help during the pandemic. Students value leaders who have bravery in how they pursued solutions and feel that the best leaders work hard to make those visions a reality. The connection between the pandemic leadership model and the existing frameworks of Complexity theory and Shared Leadership theory suggests their appropriateness for effective leadership in the current context. Both models emphasize the need to respond to changing and dynamic systems and act within the framework of the interconnections of diverse pieces.[26] The closest parallel to this leadership concept in the University of Michigan Medical School leadership training is the Capstone-for-impact project, where medical students are given the opportunity to "take on the society's biggest challenges in health, health care and health system delivery while in medical school".[30] Our findings suggest that programs like this are aligned with student values and may be useful as part of leadership training programs in additional settings.

There are some notable limitations to this study. First, the survey was designed to address student perceptions of leadership in a crisis. By design, the response characteristics will be focused on positive and negative leadership in response to the current global pandemic. While this provided a unique opportunity to develop theory in the real world and is very relevant to future challenges physicians may face, it may also limit the generalizability of the results to a broader leadership curriculum. Leadership in the context of everyday practice may not be exactly the same as leadership during a crisis and students may value different characteristics. Additionally, this study surveyed students at one large medical school in the United States and as such, these findings may not represent the values of medical students in other locations with different cultural milieus.

However, given the increasing prevalence and importance of leadership training curricula in medical education, this study hopes to be used as the first step in developing effective and relevant leadership training programs in undergraduate medical education. Our aim is that by developing the pandemic model of leadership, we provided a framework for understanding the implicit beliefs medical students hold about their leaders. Specifically, these models could be used in the

development of case studies, communication techniques, and skills grounded in the frameworks of these theories of leadership.

Current leadership education programs are not grounded in an understanding of the characteristics and values students look for in their leaders.[10,11] Development of leadership curricula across medical education is limited without this understanding of the student views and attitudes towards ideal and poor leadership qualities. This framework, in turn, can be used to help inform future curriculum development. The connection between the pandemic leadership model and the existing frameworks of Complexity theory and Shared Leadership theory suggests their appropriateness for effective leadership in the current context. It is also important to note that there may be little to no space to add additional stand-alone leadership training content to full medical school curricula. Therefore, integrating leadership training into longitudinal curricula with natural overlapping content may be necessary to ensure time and space for this essential training.

The context of a global pandemic provides a unique opportunity to find the values students look for in their leaders in the real world and fill this important gap, grounding medical school programs as they prepare students to meet the challenges of the future. Medical schools have an opportunity to better train their students to be leaders in crisis through specific training on the themes described above: information use and dissemination, decision-making and team-development, and communication skill. Leadership training programs in medical education would benefit from further grounding in these student values.

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Original Article

Supplementary Material:

Supplemental Appendix 1: Detailed Review and Examples of Leadership Themes in Context

Student responses were analyzed for themes which are presented here in context, with examples.

Use of Information

The theme of information arose in many contexts surrounding the question of what makes a good leader and is central to the model of excellent leadership according to medical students. This central theme refers to both the gathering of information and the dissemination of information.

"Good leaders spend more time listening to others than talking themselves, because it's critical to be as fully informed as possible before making decisions." -31-year-old male, Late Branch Student (M4)

Use of information arose strongly in the passages about qualities of bad leadership as well, with particular emphasis placed on closed-mindedness and ignoring or avoiding information. Students felt that these qualities limited effectiveness in a crisis.

"Narrow-mindedness and stubbornness [limit effectiveness] because situations evolve so quickly you can't get attached to any 1 idea or plan." -male Dual-Degree Student

Other-Orientation-->Altruistic Team-building

This theme relates to both the positive values of the leader and the coalition and team-building activities of the leader. This theme is directly related to the interconnected nature of Complexity Leadership theory and integral to the Shared Leadership theory. "Other-orientation" refers to the ways in which leaders act in relation to those they lead or their communities at large. Several described the need to be working toward the greater good, acting in service of others, and creating opportunities -- labeled broadly as team-building.

Others discussed the characteristics of kindness, selflessness, and empathy in ideal leaders that they observed, leading to the altruistic label.

One student, discussing the importance of altruism during the pandemic, described the ideal leader as,

"someone who is approachable, kind and comforting in these times, while doing their best to help in any way." -24-year old female, Scientific Trunk student (M1)

Many students discussed the need for team-building and working together. This emphasis on team-building to solve problems is present throughout student comments and is reflective of the collective leadership ideal that people are inherently most capable as a coalition.

When discussing examples of particularly bad leadership, students discussed polarization, politics and selfishness.

"Selfishness is detrimental because everybody is sacrificing something" -28-year old female, Clinical Trunk Student (M2)

These attitudes reflect a rejection of traditional leadership hierarchy in favor of collective leadership in a pandemic.

Communication

In pandemic leadership, communication serves as a central theme and the substrate and filter through which information flows to and from others for team-building and altruism. Communication is also the vehicle for decisive action and for communicating the results of those actions. Clear and consistent communication was also seen as important for leaders.

One student appreciated that, when writing about one of the leaders of the pandemic response:

"Effective communication includes giving the right amount of information, in the right platform, and organized in a way that emphasis[sic] key points" -female, Early Branches Student (M3)

The idea of regular and timely updates in order to address fears, communicate strategies, and provide information as situations evolve was present in a large plurality of student comments. This relates to the relationship of communication to others, for use in reassuring and supporting other teams.

When discussing poor leadership, communication remained a central theme, with students stating: "not having one constant message is very detrimental" and that "making false statements confuses the public, abolishes public unity, can lead to less trust in public health officials." -25-year old female, Clinical Trunk Student (M2)

A lack of transparency or honesty, unclear communication and the spread of misinformation were held up as communication characteristics of bad leadership. Communication between systems is one of the central tenets of Complexity Theory and of Collective Leadership. This sentiment was paralleled in student comments about pandemic leadership.

Decisive Action

Students described in detail the need for leaders to take decisive action in a crisis, sharing that leaders must take initiative and follow through on their vision. Several students cited decisive action taken by leadership at the medical school level, both by other students and by administration. These actions were aimed at responding to the crisis and creating new opportunities for people to help during the pandemic. The leaders were described as having bravery in how they pursued solutions and that the best leaders worked hard to make those visions a reality. This is best described as the output or endpoint of the pandemic leadership model. In parallel with Complexity Theory, action is informed by and feeds back into information systems, forming an interconnected loop.

"Great communication, thoughtful and decisive action, and willingness to get to work. I think all of these behaviors put the entire community at ease, and instill a certain sense of trust" -26-year-old male, Late Branches Student (M4)

Students discuss the relationship of action with an understanding of others and of the complexity of the situation. Poor leaders were said to embody opposite characteristics, with one student commenting on laziness and lack of hard work.

"Laziness: "big idea" people can sometimes pitch their idea but not contribute to making it actionable, and this is further complicated by a

pandemic, when everyone is stretched thinly. If you're going to lead a team, you should be willing (and expecting!) to put in the most hours. Coattail riding: sort of articulated in the above points, but the craziness of a crisis makes it easier for behaviors like this to go unnoticed. This would leave me very disappointed in a leader." -23-year-old female, Scientific Trunk Student (M3)

This speaks to the ineffectiveness of leadership that does not take the system and interrelatedness of the teams into account. This more isolated view of leadership is the converse to Complexity Theory and Collective Leadership and again affirms the fit of these models within effective pandemic leadership.

Personal Characteristics

The theme of personal characteristics refers to intrinsic traits and methods of acting of the leaders themselves. Participants described several personal traits that good leaders embody. These traits are strongly emphasized in the theory of Shared Leadership and deemphasized in more traditional hierarchical models of leadership.

Specifically, many discussed the need for humility in leadership, saying that it's very important for leaders to know their limitations.

"Effective leaders act with humility, integrity, and respect; they are willing to learn what they don't already know about the situation, and willing to take feedback from those who are most impacted/who are not in leadership positions." – 26-year-old female, Dual Degree Student

By discussing the need to receive feedback from other stakeholders in the system, this quote relates directly to Complexity Theory in relation to systems and situational approach. It also directly refers to the need to work with additional experts and lead a collective, again confirming the appropriateness of Collective Leadership theory in this case.

Poor leaders were described as arrogant and displayed a lack of accountability in their actions; characteristics that fit within the issues of traditional leadership theories. When describing negative leadership qualities, one student mentioned:

"Blaming others for one's own shortcomings. In this pandemic, this is particularly detrimental, when we see leaders emerging and offering their talents in new ways (i.e. the auto executives shifting production to respirators and ventilators), there is no reason to blame others. All of us can do something to help." -28-year-old female, Late Branches Student (M4)

These actions of blaming others and avoiding responsibility are the antithesis of Shared Leadership and further support this model's effectiveness in complex situations such as a global pandemic.

In the Pandemic Leadership model (***Figure 2***), personal characteristics inform the use of information and altruistic team building, with unidirectional arrows. The intrinsic characteristics of the leader inform their orientation and response to the pandemic.

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Original Article

Social Determinants of Health Amplify the Association Between Ethnicity and COVID19: A Retrospective-Cohort study

Nicholas Verdini,[1] Jessica LeClair,[2] Elizabeth Quinn,[3] Amer El-Haddad.[3]

Abstract

Background: People in racial and ethnic minority groups have been shown to be at increased risk for a variety of diseases, including COVID-19. However, the role that social needs play in this increased risk has not yet been quantified. Investigating these roles can elicit a greater understanding of how social needs influence the manner in which this disease is contracted and spread. **Methods:** A retrospective analysis was conducted of 1,969 Lynn Community Health Center patients. Patients that visited the center between February 1st and July 1st, 2020, tested for COVID-19, and screened for social determinants of health (SDOH) risk factors. Demographics were compared between COVID-19 positive and negative patients. Confounding by age on the association between ethnicity and COVID-19 status was evaluated. A stratified analysis was performed to evaluate the effect modification of SDOH on the relationship between race, ethnicity, and COVID-19 status. **Results:** Hispanic patients had 2.93 times the odds of a positive COVID-19 test compared to non-Hispanics (95% CI: 2.37 - 3.64, p<0.0001). With at least one SDOH risk factor, Hispanics had 4.71 times the odds of a positive COVID-19 test relative to non-Hispanics (95% CI: 3.10 - 7.14). With no SDOH risk factors, Hispanics had 2.45 times the odds of a positive COVID-19 test relative to non-Hispanics (95% CI: 1.91 - 3.16). No significant associations were found for race. **Conclusion:** Ethnicity had a significant impact on COVID-19 status in our population, where the effect of ethnicity on COVID-19 status was amplified for those with SDOH risk factors.

Key Words: Social determinants of health; COVID-19; Healthcare disparities (Source: MeSH-NLM).

Introduction

The novel coronavirus, COVID-19, was first reported in Wuhan, China in December of 2019. The COVID-19 outbreak has since been declared a global pandemic, with the first United States case confirmed on January 20th, 2020 in Washington state[1]. Transmission of the virus occurs primarily from person-to person via respiratory droplets produced by coughing, sneezing, or talking.[2] Within the United States, Massachusetts has been one of the states most severely affected, with one of the highest cumulative incidence rates of COVID-19.[5] To this end, Massachusetts launched a "Stop the Spread" initiative on July 10th, 2020, to provide free testing, regardless of symptoms, to eight of the most affected towns in the state, many of which are economically disadvantaged. One of the cities included in this initiative was the city of Lynn.[6] Lynn has a median household income of $56,181, compared to the national median of $68,703.[7] Additionally, 16.6% of the city population lives in poverty, compared to 10.5% nationally.[7] To understand why cities such as Lynn are particularly vulnerable to COVID-19, our study aimed to elucidate the influence of race, ethnicity, and social determinants of health on COVID-19 diagnosis.

It is known that essential worker status, congested housing, incarceration, lack of access to healthcare, and diseases like tuberculosis, HIV, and diabetes mellitus increase the risk of COVID-19 infection. [2-4] These risk factors disproportionately affect racial and ethnic minority groups.[8] According to the Center for Disease Control's (CDC), as of February 28th, 2021, 21% of COVID-19 cases are of Hispanic ethnicity, 12.2% are Black, and 56% are White. However, Black persons account for 18% of the U.S population, Hispanics and Whites account for 13% and 76.3% of the population, respectively.[9] The CDC also found that racial and ethnic minority groups have four to five times higher rates of hospitalization from COVID-19 compared to non-Hispanic white persons, as well as increased rates of death.[10] This suggests that minority populations are disproportionately affected by COVID-19. These disparities are likely due to long-standing systemic racism and social inequalities present in both society and the medical system.

Although the CDC has determined a relationship between racial and ethnic minorities with COVID-19 status, that research was limited in that the relationship of these minority groups and COVID-19 status was not evaluated with respect to social determinants of health (SDOH). Social determinants of health are defined by the U.S. Department of Health and Human Services as "the conditions in the environment where people are born, live, learn, work, play, worship, and age that affect a wide range of health, function, and quality-of-life outcomes and risks." [11] The relationship between SDOH and numerous illnesses is well documented.[12-14] The purpose of this study is to evaluate the relationships between race, ethnicity, social risk factors, and COVID-19 in our population of Lynn Community Health Center (LCHC) patients.

Materials or patients and methods

Patient Population

This study was conducted using data compiled from electronic health records of the Lynn Community Health Center (LCHC). Aggregate-level data was collected using the Slicer Dicer software in Epic, an electronic medical record software, and an IRB informed consent waiver was obtained from Lynn Community Health Center and Tufts University School of Medicine. We extracted all LCHC patient medical records that fit the following inclusion criteria: i) the patient visited LCHC between

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February 1st, 2020, and July 1st, 2020, ii) the patient was tested for COVID-19, and iii) the patient was screened for four social determinants of health (SDOH) risk factors (food access, transportation access, utility status, and housing status). 1,969 LCHC patients met the inclusion criteria and were included in the final analysis sample. All patients meeting this inclusion criteria were included. There were no exclusions or eliminations from this group. Demographics including age group, sex, race, ethnicity, zip code of residence, and SDOH status were also extracted, if available. Note that because we did not require nonmissing demographics as inclusion criteria, some patients in our analysis sample may be missing these demographics. For this reason, while we have a final analysis sample size of 1,969, this is not necessarily the number included in every analysis utilizing demographic data. Collection of human data was in accordance with guidelines within the Declaration of Helsinki.

SDOH Screening

We utilized Epic data from an SDOH questionnaire provided by Community Care Cooperative, a MassHealth Accountable Care Organization, provided in ***Supplementary Materials***. The questionnaire consisted of eight questions (one of which was the date) regarding social environment, including: housing status and adequacy, food insecurity, lack of access to transportation, risk of utilities being shut off, and job status. This questionnaire was derived from the 26 question Accountable Health Communities Health-Related Social Needs Screening Tool. The Centers for Medicare and Medicaid constructed the screening tool with a panel of national experts and review of existing screening instruments.[17-18] The questionnaire was shortened to eight questions by a coordination between Community Care Cooperative, Massachusetts Medical-Legal Partnership of Boston, and Lynn Community Health Center in order to make this an appropriate over-the-phone screening tool. The screening was conducted after patients were tested for COVID-19 and was documented in their electronic medical records. Patients were flagged as at risk if they selected any option on any question that was not "I am not sure," "None of the above," "No," or "Never true."

Statistical Methods

The analysis sample included 1,969 LCHC patients who met the inclusion criteria. Distributions of patient demographics were descriptively compared between COVID-19 positive and negative patients. To assess any differences in these baseline demographics, chi-square tests and logistic regressions were performed.

In addition to these bivariate tests of association, the intricate relationships between ethnicity, social determinants of health, and COVID-19 status were further investigated by evaluating possible confounding and effect modification. Namely, the extent of confounding by age on the association between ethnicity and COVID-19 status was evaluated by assessing whether the percent change in Cochran Mantel-Haenszel (CMH) odds ratio estimates was more than 10% from the unadjusted odds ratios. Additionally, to evaluate the possibility of effect modification by SDOH on the relationship between ethnicity and COVID-19 status, a stratified analysis was performed. Odds ratios describing the association were calculated for those with at least one SDOH risk factor and those with no SDOH. To assess the presence of effect modification, the Breslow-Day Test for Homogeneity of the Odds Ratios was performed. A two-sided significance level of 5% was used to determine statistical significance in all analyses. SAS 9.4 was used to perform all analyses.

Results

Patient Demographics

Our analysis sample included 1,969 patients from LCHC (***Table 1***). Of these 1,969 patients, there were 969 (49.21%) patients with a positive COVID-19 test result and 1000 (50.79%) patients with a negative result. For both COVID-19 positive and negative patients, patients in the 18-44 years old age group were the largest cohort. The majority of patients self-identified as White, of which 443 were COVID-19 positive and 512 were COVID-19 negative. 442 patients self-identified as Black, of which 198 were COVID-19 positive and 244 were negative. Self-identifying Hispanic patients made up the greatest number of patients in both positive and negative patients, of which 792 were COVID-19 positive and 619 were COVID-19 negative. Most patients in the study were negative for at least one SDOH risk factor, of which 701 were COVID-19 positive and 739 were COVID negative. The zip code 01902 made up the overwhelming majority for the place of residence for this patient group. Finally, female patients made up 61.71% of patients in our study (***Table 1***).

Association of patient demographics with COVID-19 status

Of the demographics collected in this study, age (p<0.0001), ethnicity (p<0.0001), zip code (p=0.0102), and sex (p<0.0001) were significantly associated with COVID-19 infection (***Table 1***). Race (p=0.5789) and the presence of at least one SDOH (p=0.4357) were not statistically significant (***Table 1***). In our sample, Hispanic patients had 2.93 times the odds of testing positive for COVID-19, compared to non-Hispanics (95% CI: 2.37 - 3.64) (***Table 2***). Although the presence of at least one SDOH risk factor was not in itself significant with COVID-19 (***Table 1***), the possibility of effect modification of the association between ethnicity and COVID-19 status by SDOH risk factors was evaluated. This was done via an SDOH-stratified analysis (***Table 3***). When at least one SDOH risk factor is present, Hispanics have 4.71 times the odds of testing positive for COVID-19 relative to non-Hispanics (95% CI: 3.10 - 7.14). Contrastingly, when there are no SDOH risk factors present, Hispanics have 2.45 times the odds of testing positive for COVID-19 relative to non-Hispanics (95% CI: 1.91 - 3.16). Given that these odds ratios are significantly different as evidenced by the Breslow-Day test (***Table 3***, p-value = 0.0085), there is evidence of effect modification by SDOH risk factors. Of note, a similar analysis first testing effect modification of SDOH, then confounding, was performed for the association between race and COVID status. However, we did not have evidence of effect modification by SDOH, nor confounding by SDOH (***Table 4***, Breslow-Day p-value = 0.9075, CMH p-value = 0.5783).

Table 1. Association Between Demographics and COVID-19 Status

Variable	COVID Test Result		P-value
	Positive (n=969)	Negative (n=1,000)	
Age			
Under 18	63 (6.50%)	33 (3.30%)	<0.0001
18-44	575 (59.34%)	499 (49.90%)	
45-64	274 (28.28%)	382 (38.20%)	
65+	57 (5.88%)	86 (8.60%)	
Race			
Black	198 (30.89%)	244 (32.28%)	0.5789
White	443 (69.11%)	512 (67.72%)	
Ethnicity			
Hispanic	792 (83.46%)	619 (63.23%)	<0.0001
Non-Hispanic	157 (16.54%)	360 (36.77%)	
At least one SDOH Risk Factor			
Positive	268 (27.66%)	261 (26.10%)	0.4357
Negative	701 (72.34%)	739 (73.90%)	
Zip Code			
1901	22 (2.48%)	44 (5.54%)	0.0102
1902	537 (60.54%)	473 (59.57%)	
1904	72 (8.12%)	69 (8.69%)	
1905	256 (28.86%)	208 (26.20%)	
Sex			
Male	422 (43.55%)	332 (33.20%)	<0.0001
Female	547 (56.45%)	668 (66.80%)	

Table 2. Association Between Ethnicity and COVID-19, Before and After Adjusting for Age*

	COVID Test Result	
Ethnicity	**Positive (N=949)**	**Negative (N=979)**
Hispanic	792 (83.46%)	619 (63.23%)
Non-Hispanic	157 (16.54%)	360 (36.77%)
Unadjusted Odds Ratio (95% CI): 2.93 (2.37, 3.64)		
Age-Adjusted Odds Ratio (95% CI): 2.81 (2.26, 3.49)		

Legend: *While out study size was 1,969, due to missing data, this analysis sample only contained 1,928.

Table 3. Association Between Ethnicity and COVID-19 Status Stratified by SDOH Risk Factor

At least one SDOH Risk Factor		
Breslow Day Test p-value: 0.0085		
	COVID Test Result	
Ethnicity	Positive (N=260)	Negative (N=258)
Hispanic	220 (84.62%)	139 (53.88%)
Non-Hispanic	40 (15.38%)	119 (46.12%)
Odds ratio (95% CI): 4.71 (3.10, 7.14)		
No SDOH Risk Factors		
	COVID Test Result	
Ethnicity	Positive (N=689)	Negative (N=721)
Hispanic	572 (83.02%)	480 (66.57%)
Non-Hispanic	117 (16.98%)	241 (33.43%)
Odds ratio (95% CI): 2.45 (1.91, 3.16)		

Legend: *While our study sample size was 1,969, due to missing data, this analysis sample only contained 1,928 patients.

Table 4. Association Between Race and COVID-19 Status Stratified by SDOH Risk Factor

At least one SDOH Risk Factor		
Breslow Day Test p-value: 0.9075		
	COVID Test Result	
Race	**Positive**	**Negative**
Black	48 (30.77%)	63 (31.66%)
White	108 (69.23%)	136 (68.34%)
Odds ratio (95%CI): 0.96 (0.61,1.51)		
No SDOH Risk Factors		
	COVID Test Result	
Race	Positive	Negative
Black	150 (30.93%)	181 (32.50%)
White	335 (69.07%)	376 (67.50%)
Odds ratio (95%CI): 0.93 (0.72,1.21)		

Given that age was significantly associated with COVID-19 status (***Table 1***, p-value <0.0001) and that age and ethnicity were also significantly associated (***Table 5***, p-value <0.0001), the extent of confounding by age on the association between ethnicity and COVID status was also evaluated. Ultimately, adjusting for age only changed the odds ratio estimate by 4.1%. This suggested confounding by age on this association was minuscule, and hence the unadjusted results were appropriate (***Table 2***). Because SDOH risk factors were demonstrated to be an effect modifier on the relationship of ethnicity and COVID-19 status, it would have been ideal to evaluate the extent of confounding by age on this more complex association. However, due to low cell counts produced when splitting the data into multiple strata, this adjustment was not possible.

Discussion

The COVID-19 pandemic has impacted the daily lives of all people. However, this pandemic has not affected all people equally. In our patient cohort, ethnicity had a significant impact on COVID-19 status, where being of Hispanic ethnicity (versus not being of Hispanic ethnicity) alone was a significant risk factor for COVID-19. This is consistent with the CDC's national finding of higher rates of COVID-19 among the Hispanic population.[10]

Results Interpretation

This disparity in COVID-19 among ethnic groups in our cohort was amplified by the presence of SDOH risk factors. While the presence of an SDOH risk factor alone was not significantly associated with COVID-19 status, it proved to be a significant effect modifier on the ethnicity and COVID-19 relationship. In other words, our results show that those who are Hispanic are at an increased risk of COVID-19 infection and those who are Hispanic and have a SDOH risk factor are at an even greater risk. This increase in COVID-19 risk for Hispanics with a SDOH risk factor is disproportionate compared to non-Hispanics in our population. These findings may be due to a variety of systemic factors and inequities in social determinants of health that put racial and ethnic minorities at increased risk for disease. The Hispanic population has been shown to experience discrimination, inadequate healthcare access and utilization, inequities in education access, wealth gaps, and increased congested housing, all of which increase the risk of contracting COVID-19.[19-26] In Lynn, MA where 42.8% of the population is Hispanic[7], addressing these discrepancies in health is of great importance in order to control COVID-19 and future health crises.

While this data does not describe why SDOH status and ethnicity cause such a significant change in COVID-19 status, it provides tangible evidence that these disparities do exist and that they affect health. This highlights the importance of recognizing, studying, and making changes to the inequalities that lead to these social disparities. SDOH have also proven to lead to disproportionate adverse health outcomes in many other instances, like premature mortality, mental illness, congenital anomalies, Type 2 Diabetes, and bacterial infections.[27-30] Additionally, COVID-19 is not the first pandemic where SDOH have played a role in enlarging health disparities amongst minorities and those of lower socioeconomic status. For instance, the United States HIV epidemic has shown a greater overall illness burden amongst those at the lowest levels of socioeconomic status,[32] primarily of minority ethnicity and race. Even in the 1918 influenza pandemic, research has shown that those living in Chicago neighborhoods with higher illiteracy had increased risk of influenza mortality.[33]

Additionally, age was significantly associated with COVID-19 positivity. This is a well-known finding and many hypotheses have been published as to why age influences susceptibility to COVID-19. According to CDC data, age distribution for COVID-19 cases follows a bell-curve relationship, with those between the ages of 18 and 64 making up the greatest number of positive cases.[34] While there are many biological reasons as to why this may be the case, i.e., ACE2 receptor density amongst different age groups, there are also proposed social reasons for this. Long-term care facilities for elderly, as well as daycare and public schools were amongst the first to institute COVID-19 restrictions. On March13th, 2020, the Centers for Medicare & Medicaid Services issued a lockdown order, banning everyone but essential personnel from entering nursing homes.[35] On March 16th, the Commonwealth of Massachusetts ordered the closure of all public and private elementary

and secondary schools.[36] This decrease in contact with other persons in these two age groups prevents transmission of COVID-19.[37-39]

Limitations

Although this study highlighted the important relationship that SDOH plays in the COVID-19 pandemic in our cohort, it has limitations. In our patient cohort, we did not find the same result that the CDC and other publications had concerning race and COVID-19 status. This may be due to limitations within the questionnaire. Limitations include the lack of SDOH questions concerning specific housing conditions (e.g., congestion, ability to social distance), essential worker status, income, and medical insurance status. These limitations may have resulted in patients not being included in the study that had SDOH risk factors. These SDOH risk factors that were not included have been shown to be significantly related to COVID-19 cases.[24-26] In particular, essential worker status is an important metric that was not assessed by this questionnaire. Essential worker status has been shown to be associated with greater COVID-19 infection and mortality. This association is not free from disparity. Research has shown that Non-Hispanic Blacks disproportionately occupy essential-worker positions compared with Non-Hispanic Whites. [26] By not assessing essential-worker status, it is possible that Black patients who did have this SDOH were not included in the study.

The SDOH Questionnaire is also a limitation of the study in that the reliability and validity of this tool have yet to be investigated. While the tool was constructed by an experienced panel based on commonly used or evidence-based questions, the questionnaire has not been tested as a unit and therefore data on reliability and validity is not available. Additionally, patients may not feel comfortable disclosing these personal parts of their social environment and this will cause an under detection of patients with SDOH risk. Our patient population was limited to those who were tested at Lynn Community Health Center and therefore, these results may not necessarily be generalizable to other populations. Finally, we did not evaluate whether there was an association between sex and ethnicity in our sample, which if significant, would have indicated potential confounding by sex. Acknowledging these limitations, we nonetheless report an association between ethnicity, SDOH, and COVID-19 status.

Table 5. Evaluating the Association Between Age and Ethnicity to Evaluate Age as a Potential Confounder.

	Ethnicity		
Age	**Hispanic**	**Non-Hispanic**	p-value
Under 18	76 (5.39%)	16 (3.09%)	<0.0001
18-44	803 (56.91%)	246 (47.58%)	
45-64	448 (31.75%)	199 (38.49%)	
65+	84 (5.95%)	56 (10.83%)	

Conclusion

Investigating the underlying causes for the stark ethnic differences in COVID-19 infection rates can lead to a greater understanding of the virus spread and may help control it. Further research should be conducted, with a focus on a larger spectrum of demographics and social determinants of health to develop a greater understanding of the sociodemographic disparities in this pandemic and other health disparities. Additionally, measures should be taken to proactively record SDOH risk status as patients are tested for COVID-19 in order to provide a greater perspective of SDOH effects on acquisition and spread of the virus. Increased quantitative data linking SDOH and health outcomes would be influential in changing health policy. A lack of data on health equity outcomes, as well as methods that work to reduce disparities in said outcomes has been cited as a major obstacle to policy change.[40] The number of studies that evaluating public policy and its impact on health equity continue to rise, but the number is still relatively small. A few states in the U.S., one example being Oregon, are utilizing systems incentivizing providers based on equity performance. It will be important to evaluate the effects this has on health equity outcomes.[41]

An increased focus on addressing social disparities in healthcare can aid in preventing a similar pattern in future health crises and decrease the gap of adverse health outcomes amongst minority populations in the United States. Additionally, a standardized method for healthcare systems to collect SDOH data and the impacts of programs and policy designed to address disparities in health outcomes must be implemented in order to make advances and prevent further studies needing to cite lack of data as a barrier to improvement.

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Author Contributions

Conceptualization, Project Administration: NV, EQ, AEH; Formal Analysis, Software: JLC; Investigation: NV; Resources, Supervision: EQ, AEH; Data Curation, Methodology, Funding Acquisition, Writing – Original Draft Preparation: NV, JLC; Validation, Visualization & Writing – Review & Editing: NV, JLC, EQ, AEH;

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Supplementary Material:

Social Determinants of Health Questionnaire

ENGLISH

Name _____

DOB _____

Medical Record # _____

Directions: Please fill out all the questions, whether you are answering for yourself or for a child, so that your care team has the most complete information to care for you.

STAFF ONLY

Completed:
- ❑ In-person
- ❑ By mail
- ❑ By phone
- ❑ By Email
- ❑ Other

1. Today's Date: ____/____/_____

2. What is your housing situation today?
   - ❑ I do not have housing (staying with others, in a hotel, in a shelter, living outside on the street, on a beach, in a car, or in a park)
   - ❑ I have housing today, but I am worried about losing housing in the future
   - ❑ I have housing
   - ❑ I am not sure

3. Think about the place you live. Do you have problems with any of the following? (Check all that apply)
   - ❑ Pests such as bugs, ants, or mice
   - ❑ Mold
   - ❑ Lead paint or pipes
   - ❑ Inadequate heat
   - ❑ Oven or stove not working
   - ❑ No or not working smoke detectors
   - ❑ Water leaks
   - ❑ None of the above
   - ❑ I am not sure

4. Within the past 12 months, you worried that your food would run out before you got money to buy more.
   - ❑ Often true
   - ❑ Sometimes true
   - ❑ Never true

5. Within the past 12 months, the food you bought just didn't last and you didn't have enough money to get more.
   - ❑ Often true
   - ❑ Sometimes true
   - ❑ Never true

6. In the past 12 months, has lack of transportation kept you from medical appointments, meetings, work or from getting things needed for daily living? (Check all that apply)
   - ❑ Yes, it has kept me from medical appointments or getting medications
   - ❑ Yes, it has kept me from non-medical meetings, appointments, work, or getting things that I need
   - ❑ No
   - ❑ I am not sure

7. In the past 12 months has the electric, gas, oil, or water company threatened to shut off services in your home?
   - ❑ Yes
   - ❑ No
   - ❑ Already shut off
   - ❑ I am not sure

8. Do you want help finding or keeping work or a job?
   - ❑ Yes, help finding work
   - ❑ Yes, help keeping work
   - ❑ I do not need or want help
   - ❑ I am not sure

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Original Article

Pandemic-Related Experiences and Psychosocial Risk Associations Among U.S. Medical Students

Nathaniel A. Jenkins,[1] Damion J. Grasso.[2]

Abstract

Background: Since the start of the COVID-19 global pandemic there has been a profound impact on the psychosocial health of medical professionals, with heightened risk reported on measures of depression, anxiety, and stress relative to non-healthcare professionals. However, there is limited data on the impact of COVID-19 on the psychosocial health of U.S. undergraduate medical students. The current cross-sectional study aims to examine associations between pandemic-related experiences and psychosocial risk among a sample of medical students attending a Northeastern U.S. allopathic medical school. **Methods:** One-hundred and seventy-nine students (42.6% of the study body) completed an online survey during the COVID-19 pandemic that included sociodemographic characteristics, the 30-item Brief Epidemic-Pandemic Impacts Inventory (EPII-B), the 2-item Patient Health Questionnaire (PHQ-2), the 2-item Generalized Anxiety Disorder (GAD-2), and the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5). **Results:** Rates of serious adverse pandemic-related experiences (e.g., increased conflict, less physical activity, frequent substance use) were as high as 37.5%. Students with a greater number of adverse pandemic-related experiences reported more time with COVID-19 positive patients and were more likely to screen positive for depression, anxiety, and PTSD (r_s from 0.25 – 0.34, all $ps < 0.01$). **Conclusion:** These findings suggest the need for other U.S. medical schools to evaluate and address medical student mental health during the COVID-19 public health crisis.

Key Words: COVID-19; Medical education; Professional Burnout; Depression; Anxiety (Source: MeSH-NLM).

Introduction

The World Health Organization declared COVID-19 a global pandemic on March 11, 2020.[1] Since then, many aspects of daily life have drastically changed, with constraints on interpersonal relationships, work, home life, and mobility as a result of occurrences such as social distancing, virtual activities, furlough, increased contact with household members, less contact with extended family, forced quarantine, and government enforced lockdowns. Several studies thus far have linked pandemic stress to heightened risk for psychosocial impairment in the general population during this time.[2,3] This effect seems to be pronounced for healthcare workers on the 'front-line', which may be partially attributed to long working hours, shortages of personal-protective equipment (PPE), emotional distress caring for COVID-19 patients, and the stigma associated with chronic potential exposure to the virus.[4,5]

Medical students are important members of the healthcare sector. Even before COVID-19, previous studies have demonstrated that medical students tend to experience more mental health issues than the general population, such as higher rates of depression, anxiety, and burnout.[6] This is thought to be attributed, at least in part, to the demanding curricula, pressure to pass exams, and emotional taxation.[7] Despite medical students having greater access to mental health services, often provided by their respective institutions, research shows that they are less likely to access those services when compared to the general population, perhaps due to increased mental health stigma.[8]

Since medical students serve dual roles as both students and healthcare providers, it is likely that medical students may also have heightened risk for psychosocial impairment during this time. Special considerations for this group include observation of human suffering, alterations to pre-clinical/clinical training, changes in medical licensing exam policies, and the adjustment process into a high-risk workplace environment. One recent U.S. study determined that when compared to previous studies, medical students were scoring 61% higher on anxiety screenings (GAD-7) and 70% higher on depression screenings (PHQ-9) early in the pandemic.[9] These findings align with data in other countries where the prevalence of depression, anxiety, and burnout of medical providers during the pandemic has been observed as significantly higher than prior to the pandemic.[10,11]

Despite these initial findings, the effect of COVID-19 on medical student mental health has not yet been sufficiently studied in the United States. Additionally, no studies thus far have utilized an inventory of pandemic-specific stressors to explore this topic in medical student samples. The current study employs a novel instrument called the Brief Epidemic-Pandemic Impacts Inventory Brief (EPII-B) to examine specific pandemic-related experiences across multiple domains of life (i.e., home life, work/environment, social activities, emotional/physical health).[12] Recent studies have employed this tool and demonstrated its usefulness in linking psychosocial experiences with the COVID-19 pandemic for employees that work in direct patient care as well as for patients that frequent healthcare settings.[13,14] By using this instrument, in combination with other standardized screening tools for depression, anxiety, and posttraumatic stress, we sought to further characterize how specific COVID-19 pandemic-related experiences among U.S. medical students link to associated psychosocial risk.

Methods

Study Design

During a 4-week period between February 23rd 2021 – March 23rd 2021, allopathic medical students from the University of Connecticut School of Medicine were invited via email to complete an online survey for a chance to win a $25 gift card. Inclusion criteria for the study were to be a University of Connecticut School of Medicine student, be actively

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studying in the curriculum, and to give informed consent. There were no exclusion criteria. An email with the survey link was sent using a closed listserv only available to medical students at this school. The email was sent a total of four times during this period. The survey was administered using Qualtrics software in an anonymously. To prevent duplicate entries, participants were required to disclose any previous survey engagement. Endorsement of previous engagement resulted in survey termination. Additionally, students provided university issued email addresses. No email address was entered twice. At the completion of the survey, participants who were interested in the gift card were redirected to a separate Qualtrics survey that collected school-specific email addresses to ensure inclusion criteria. This data was kept separate from the main survey data and could not be matched. The University of Connecticut Health Center Institutional Review Board approved the study protocol (number 21X-148-2) prior to distribution of the survey. Passive consent was obtained.

Study Measures

The survey began with confirmation that the participant had never taken the survey before, followed by a series of sociodemographic questions (medical school year, preferred gender, age, and race). Sliding scales were used to estimate what percent of students' time in medical school was spent with patients, and specifically, pediatric, adult, geriatric, and COVID-19 positive patients.

The 30-item EPII-B assessed whether several pandemic-related experiences had occurred since the beginning of the pandemic and instructed participants to rate the impact of these experiences on a 5-point scale (0= "*Did not happen*", 1= "*Happened but no impact on me or my family*", 2= "*Some impact on me or my family*", 3= "*A lot of impact on me or my family*", 4= "*Extreme impact on me or my family*"). A previous study using the longer 92-item Epidemic-Pandemic Impacts Inventory (EPII) supports the validity of this tool in characterizing pandemic-associated risk for depression, anxiety, and stress.[13] A positive response (i.e., responding anything other than "*Did not happen*") was used to dichotomize each item for purposes of determining rates of occurrence. In addition, ratings on EPII-B items were tallied as a measure of perceived impact of positive experiences (2 items) and negative experiences (28 items).[12] Internal consistency reliability was α = 0.70 and 0.80 for the EPII "positive impact" and "negative impact", respectively.

The 2-item Patient Health Questionnaire-2 (PHQ-2) is a well validated screening tool for Major Depressive Disorder (MDD).[15] Likewise, the 2-item Generalized Anxiety Disorder-2 (GAD-2) is a well validated screening tool for clinical anxiety.[16] Additionally, the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) is a validated screening tool for posttraumatic stress disorder (PTSD).[17] Screening positive on any one of the three screeners was examined as the primary outcome. As with all screening tests, a positive response indicates the need for further evaluation by a health professional and could not be used to determine a diagnosis.

Statistical Analysis

Descriptive statistics were used to understand the sociodemographic characteristics of the sample. Rates on EPII-B items were presented as the percent (%) of participants responding positively to each statement. Screening positive on any one or more of the three screeners (i.e., PHQ-2, GAD-2, and PC-PTSD-5) was examined as the primary outcome. Spearman correlations, chi-square goodness-of-fit tests, and multivariate logistic regression were conducted using IBM SPSS software version 27.[18] Bonferroni corrections were applied as appropriate to adjust for multiple comparisons.

Results

The survey was completed by 179 students (42.6% of 420 total enrolled medical students). Of the total (n = 179), 68.7% (n = 123) were female, 30.7% (n = 55) were male, and 0.6% (n = 1) were non-binary. The average age was 25.7 years old with a standard deviation of ± 2.9 years. The same was comprised of first year (M1) (n = 44, 24.6%), second year (M2) (n = 40, 22.3%), third year (M3) (n = 54, 30.2%), and fourth year (M4) (n = 41, 22.9%) medical students. As such, 92 participants (52.5%) were in pre-clinical education (M1, M2) and 87 (47.5%) were in clinical education (M3, M4). Ethnic minorities represented 32.2% (n = 57) of the sample. Of all survey respondents, 27.7% (n = 41) screened positive on the PHQ-2, 48.6% (n = 72) on the GAD-2, and 24.3% (n = 36) on the PC-PTSD-5. A notable 53.4% (n = 79) of medical students screened positive on one or more of the three mental health screening tools. This data is presented in ***Table 1***.

Table 1. Study Population Characteristics

Characteristics	Missing n (%) [a]	Mean (SD)	Percent (%) [b]
Age	2 (1.1)	*25.7 (2.9)*	
Gender	0		
Female			*68.7*
Male			*30.7*
Non-binary			*0.6*
Ethnic Minority [c]	2 (1.1)		*32.2*
Medical Student Year			
First			*24.6*
Second			*22.3*
Third			*30.2*
Fourth			*22.9*
% time spent with patients			
Overall		*33.0 (30.5)*	*96.0*
Pediatrics		*10.1 (19.8)*	*54.2*
Adult		*26.8 (28.4)*	*83.8*
Geriatric		*15.6 (20.7)*	*76.5*
COVID+		*3.9 (9.8)*	*33.5*
PHQ-2 Depression Positive Screen	31 (17.3)		*27.7*
GAD-2 Anxiety Positive Screen	31 (17.3)		*48.6*
Primary Care PTSD Positive Screen	31 (17.3)		*24.3*
Any Positive Screen	31 (17.3)		53.4

Legend: A total of 179 medical students at a U.S. allopathic medical school in the Northeast responded to the questionnaire. SD: Standard Deviation, No: number, COVID+: COVID-19 positive, PHQ-2: Patient Health Questionnaire 2-item Depression Screen, GAD-2: Generalized Anxiety Disorder 2-item Screen, PTSD: Posttraumatic Stress Disorder. [a] The number and percentage of respondents that left a certain section of the questionnaire unanswered is represented in this column. [b] Percent of those who responded (eg, excluding missing). Percentages may not sum up to 100 as a result of rounding. [c] "Ethnic Minority" representing a term used to describe self-reported non-white ethnicity.

Rates of adverse pandemic-related experiences among medical students were noteworthy. Several of these were significantly associated with screening positive for depression, anxiety, and/or posttraumatic stress (***Table 2***). Specifically, the strongest correlations (all ps < 0.002) included (a) increased verbal/physical conflict among family and PTSD (r_s = 0.26), (b) not having the ability or resources to talk to or see family/friends while separated and PTSD (r_s = 0.27), (c) more frequent or severe mental health, sleep, or alcohol/substance use problems and depression (r_s = 0.40), anxiety (r_s = 0.49), and PTSD (r_s = 0.52), and (d) getting less exercise, spending more time sitting down, or eating more junk food and depression (r_s = 0.32) and PTSD (r_s = 0.27). Although not significant after Bonferroni correction, negative correlations were found between the two positive items and these measures.

Table 2. Epidemic-Pandemic Impacts Inventory (EPII) Base Rates and Correlation with Perceived Stress, Depression, Anxiety, and Posttraumatic Stress

Domain/Item	%	PHQ r_s	GAD r_s	PTS r_s
Work, Education, and Training				
Had to work in close contact with people who might be infected	47.4	0.16	0.14	0.20*
Provided direct care or services to people who had COVID	16.1	0.00	-0.03	-0.12
Had an increase in workload or work responsibilities	16.0	0.19	0.22*	0.09
Laid off, furloughed, had to close a business, or had reduced work hours	14.8	0.03	0.13	-0.03
Home Life				
Spent a lot more time taking care of a family member most days	6.1	0.04	0.17	0.12
A child or teenager/young adult I care for could not go to school or needed home instruction	5.4	-0.06	0.01	-0.08
Increase in verbal or physical conflict with a partner or spouse	5.3	0.15	0.12	0.18
My family was unable to pay important large bills like rent or utilities	4.9	-0.09	0.04	-0.06
Increase in verbal or physical conflict among other family in my home	4.8	0.21*	0.15	0.26**
My family was unable to pay for or get enough food or clean water	2.8	0.09	0.09	0.12
Had more conflict with or was harsher in disciplining my child or children	2.8	-0.02	-0.02	-0.08
Childcare or babysitting was unavailable to me or someone in my home when needed	2.1	-0.08	-0.07	-0.12
My family had to move, relocate, was evicted, or became homeless	2.1	-0.01	0.01	0.01
My child[ren] had more frequent or severe behavioral problems or emotional problems	0.7	0.06	0.07	0.00
Emotional, Physical, and Social Health				
Got less exercise, spent more time sitting down, or ate more junk food	37.5	0.32**	0.24*	0.27**
Had to cancel or not attend important celebrations, religious ceremonies, or funerals	35.9	0.01	0.00	0.02
More frequent or severe mental health problems, sleep, or use of alcohol or substances	15.4	0.40**	0.49**	0.52**
Important medical procedures cancelled or unable to access care for serious condition	13.9	0.11	0.15	0.01
Unable to access or was less satisfied with mental health treatment or therapy	7.8	0.09	0.11	0.25*
Could not get enough medication or medical treatment for a chronic illness or pain	5.2	0.17	0.14	0.21*
Trouble getting places due to less access to public transportation or concerns about safety	3.6	0.13	0.05	0.07
Did not have the ability or resources to talk to or see family/friends while separated	3.2	0.19	0.07	0.27**
Quarantine and Infection Issues				
Isolated or quarantined due to possible exposure to the disease, symptoms, or increased risk	31.0	0.06	0.13	0.21*
Limited physical closeness with my child or loved one due to concerns of infection	17.1	0.08	0.17	0.26*
Unable to be with family member hospitalized, in a nursing home, or in critical condition	11.9	-0.07	-0.01	0.02
Harassed/blamed for COVID-19, or denied services/treatment for because of race/ethnicity	6.4	0.03	0.10	0.01
A close friend or family member died from COVID-19 or related complications	2.4	0.01	-0.07	0.04
I or someone in my home tested positive for COVID-19 and had severe symptoms	1.6	0.02	-0.01	0.06
Positive Change				
More quality time together, paid more attention to personal health, or made new connections	19.0	-0.25*	-0.17*	-0.19*
Found greater meaning and was more effective in my work, school, or friendships than before	18.1	-0.22*	-0.14	-0.06

Legend: Percent of respondents experiencing each EBII-B item and the subsequent correlation of that item with depression, anxiety, and PTSD screens. Item wording in some cases is abridged. PHQ: Patient Health Questionnaire 2-item Depression Screen, GAD: Generalized Anxiety Disorder 2-item Screen, PTS: Primary Care Posttraumatic Stress Disorder Screen. *p<.01, **p<.002 (Bonferroni Correction)

Table 3. **EPII Correlation with Percent Time with Patients Across Types**

Domain/Item	Overall	Pediatric	Adult	Geriatric	Covid+
Work, Education, and Training					
Had to work in close contact with people who might be infected	0.15	0.15	0.09	0.10	0.23*
Provided direct care or services to people who had COVID	0.30**	0.11	0.22*	0.18*	0.45**
Had an increase in workload or work responsibilities	-0.03	-0.06	-0.11	-0.04	0.06
Laid off, furloughed, had to close a business, or had reduced work hours	0.06	0.02	0.08	0.01	0.07
Home Life					
Spent a lot more time taking care of a family member most days	-0.03	-0.03	-0.06	0.09	0.08
A child or teenager/young adult I care for could not go to school or needed home instruction	0.07	0.07	0.03	0.03	-0.06
Increase in verbal or physical conflict with a partner or spouse	0.15	0.05	0.07	0.07	0.21*
My family was unable to pay important large bills like rent or utilities	0.10	0.07	0.05	0.09	0.18
Increase in verbal or physical conflict among other family in my home	0.01	0.11	0.01	0.14	0.11
My family was unable to pay for or get enough food or clean water	0.02	-0.01	0.04	0.07	0.22*
Had more conflict with or was harsher in disciplining my child or children	0.09	0.06	0.09	0.09	0.12
Childcare or babysitting was unavailable to me or someone in my home when needed	0.19	0.16	0.18	0.11	0.15
My family had to move, relocate, was evicted, or became homeless	0.01	-0.06	0.06	0.14	0.14
My child[ren] had more frequent or severe behavioral problems or emotional problems	0.11	0.08	0.08	0.12	0.14
Emotional, Physical, and Social Health					
Got less exercise, spent more time sitting down, or ate more junk food	-0.05	-0.06	0.00	0.01	0.00
Had to cancel or not attend important celebrations, religious ceremonies, or funerals	0.11	0.06	0.12	0.16*	0.17
More frequent or severe mental health problems, sleep, or use of alcohol or substances	0.00	-0.03	0.03	0.14	0.05
Important medical procedures cancelled or unable to access care for serious condition	-0.05	-0.12	-0.05	0.02	0.05
Unable to access or was less satisfied with mental health treatment or therapy	0.06	0.03	0.08	0.11	0.14
Could not get enough medication or medical treatment for a chronic illness or pain	0.04	-0.05	0.07	0.15	0.22*
Trouble getting places due to less access to public transportation or concerns about safety	0.01	0.08	0.01	0.02	0.09
Did not have the ability or resources to talk to or see family/friends while separated	0.00	-0.04	0.00	0.17*	0.15
Quarantine and Infection Issues					
Isolated or quarantined due to possible exposure to the disease, symptoms, or increased risk	0.01	0.07	-0.09	0.02	0.15
Limited physical closeness with my child or loved one due to concerns of infection	0.08	-0.05	-0.04	0.02	0.04
Unable to be with family member hospitalized, in a nursing home, or in critical condition	-0.07	-0.09	0.01	0.09	0.13
Harassed/blamed for COVID-19, or denied services/treatment for because of race/ethnicity	0.19	0.19	0.16	0.25*	0.23*
A close friend or family member died from COVID-19 or related complications	-0.08	0.03	0.02	0.09	0.09
I or someone in my home tested positive for COVID-19 and had severe symptoms	-0.11	-0.02	-0.06	0.01	0.06
Positive Change					
More quality time together, paid more attention to personal health, or made new connections	-0.07	0.02	-0.09	-0.15	-0.03
Found greater meaning and was more effective in my work, school, or friendships than before	0.06	0.16	-0.02	0.01	0.11

Legend: COVID+: COVID-19 positive, EPII: Epidemic-Pandemic Impacts Inventory. *p<.01, **p<.002 (Bonferroni Correction)

Table 4. Correlation Matrix

Questionnaire	EPII Ave. Negative Impact		EPII Ave. Positive Impact		% Time w/ Patients		% Time w/ COVID Patients		PHQ-2 Positive Screen		GAD-2 Positive Screen	
EPII Ave. Negative Impact (*r*)	--											
EPII Ave. Positive Impact (*r*)	.02		--									
% Time w/ Patients (*r*)	.07		-.02		--							
% Time w/ COVID Patients (*r*)	.29	**	.05		.55	**	--					
PHQ-2 Positive Screen (r_s)	.25	**	-.26	**	-.05		.03		--			
GAD-2 Positive Screen (r_s)	.31	**	-.18	*	-.01		-.11		.43	**	--	
PC-PTSD Positive Screen (r_s)	.34	**	-.15		-.00		.01		.49	**	.39	**

Legend: Ave: Average, PHQ-2: Patient Health Questionnaire 2-item Depression Screen, GAD-2: Generalized Anxiety Disorder 2-item Screen, PC-PTSD: Primary Care Posttraumatic Stress Disorder Screen. r_s = Spearman Correlation. *p<.05. **p<.01

Correlations between EPII items and student-reported percentage of time spent with various patient populations during the past year of medical school training are represented in ***Table 3***. ***Table 4*** presents correlations between the two EPII-B impact variables (i.e., average negative and positive impact), positive screens, and estimated percentage of time spent with patients. Perceived negative impact across adverse experiences was significantly associated (all ps < 0.01) with screening positive for depression (r_s = 0.25), anxiety (r_s = 0.31), or PTSD (r_s = 0.34), and greater estimated time spent with COVID-19 positive patients (r_s = 0.29). Perceived positive impact across positive change experiences was significantly negatively correlated with positive screens on depression (r_s = 0.26, ps < 0.01) and anxiety (r_s = 0.18, ps < 0.01).

Table 5 presents results from a multivariate logistic regression testing whether perceived negative and positive impact predict a positive screen on at least one of the three screens (depression, anxiety, PTSD), controlling for age, sex, ethnic minority status, and estimated time spent with COVID-19 positive patients. In the final step of the model, significant predictors included male sex, greater estimated time spent with COVID-19 positive patients, and perceived negative impact of pandemic-related experiences. Perceived positive impact was not significantly predictive of the outcome.

Discussion

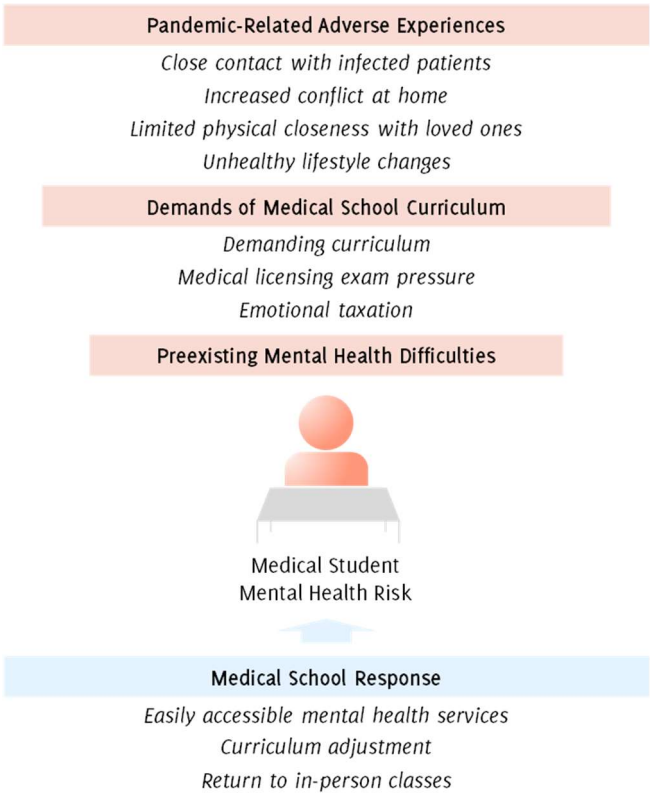
The current findings suggest that high rates of adverse pandemic-related experiences in medical students are associated with indicators of psychosocial impairment (***Figure 1***). Nearly half of the sample screened positive for depression, anxiety, or PTSD on validated screening instruments during the pandemic (n = 79, 53.4%). Several experiences on the EPII-B were associated with increased risk of screening positive on one of these screening tools. These included worsening sleep, less exercise, poor eating habits, and the inability to talk to or see family/friends. Although not addressed in the current study, it is possible that these effects may be influenced by government "lockdown" orders, quarantining, and the increase in online-learning during this time. Poor sleep quality, physical activity, diet, and social isolation are important predictors of mental health in young adults.[19,20] For example, a medical student in pre-clinical education using virtual-only learning methods may have felt more isolated and unable to exercise, socialize, etc. In a recent study, online learning appears to be an obstacle for medical students due to difficulty adapting to new learning styles, inaccessibility of educators, and poor communication with other learners.[21] Perhaps these challenges, combined with a sudden shift in routine, may have contributed to the worsening mental health in this sample of students.

Table 5. Multivariate logistic regression testing whether perceived negative and positive impact predict a positive screen on at least one of the three screens (depression, anxiety, PTSD).

Variables	*B*	*SE*	*Wald*	*p-value*	*OR*	95% CI Upper	95% CI Lower
Step One							
Age	0.09	0.09	1.15	.283	1.10	0.92	1.30
Sex (Male)	-0.77	0.40	3.72	.054	0.47	0.21	1.01
Ethnic Minority	-0.33	0.40	0.66	.418	0.72	0.33	1.59
Time w/ COVID Pts.	-0.06	0.03	5.23	.022*	0.94	0.89	0.99
Step Two							
Age	0.12	0.09	1.49	.222	1.13	0.93	1.36
Sex (Male)	-0.99	0.44	5.13	.023*	0.37	0.16	0.88
Ethnic Minority	-0.53	0.44	1.47	.226	0.59	0.25	1.39
Time w/ COVID Pts.	-0.10	0.03	9.72	.002*	0.90	0.85	0.96
EPII Negative Impact	2.42	0.62	15.01	<.001**	11.24	3.31	38.23
Step Three							
Age	0.10	0.10	0.94	.333	1.10	0.91	1.33
Sex (Male)	-1.01	0.44	5.25	.022*	0.36	0.15	0.86
Ethnic Minority	-0.42	0.44	0.91	.340	0.66	0.28	1.56
Time w/ COVID Pts.	-0.09	0.03	8.22	.004*	0.91	0.86	0.97
EPII Negative Impact	2.44	0.63	3.66	<.001**	11.42	3.32	39.26
EPII Positive Impact	-0.36	0.19	3.66	.056	0.70	0.49	1.01

Legend: COVID Pts: COVID-19 patients, EPII: Epidemic-Pandemic Impacts Inventor, B: beta-coefficient, SE: standard error, OR: Odds Ratio. *p<.05. **p<.01

Figure 1. Conceptual Diagram of Pandemic-Related Experiences and Mental Health in Medical Students



Students who screened positive for depression, anxiety, or PTSD were also more likely to screen positive for at least one other disorder. Other studies using the PHQ-2 and GAD-2 pre-pandemic have reported rates of positive depression and anxiety screens in medical students to be 16.4%[22] and 25.7%[23] , respectively. Using the same screens during the pandemic, we found higher rates, with 27.7% of students screening positive for depression and 48.6% screening positive for anxiety. Although it is not possible to attribute these higher rates to the pandemic, associations between adverse pandemic-related experiences and these measures suggest higher risk during this time.

Although few pandemic-related experiences were significantly associated with estimated time spent with COVID-19 positive patients, average perceived negative impact across experiences was significantly associated with time spent with COVID-19 positive patients (***Table 3***). This aligns with research highlighting increased stress faced by healthcare providers during the pandemic. However, while perceived negative impact was significantly associated with screening positive on at least one of the screeners, estimated time spent with COVID-19 positive patients was not. It is plausible that the increased risk of infection associated with physical proximity to COVID-19 positive patients and/or fear of infecting others exacerbates the experience of stress among clinic-naïve medical students.

The experiences of medical students during the pandemic, however, was not uniform. Given that a small percentage of participants with positive occurrences (i.e., spending more quality time with others or finding greater meaning in school/work) appeared to have less depression and anxiety, this could be attributed to additional factors. For example, certain psychosocial factors during the pandemic may have buffered associated risk of mental health impairment for some medical students. It is difficult to determine from this study what these protective factors may be and how they might buffer associated risk. Possible factors contributing to this phenomenon may include a student's living arrangement (e.g., residing with a parent vs. roommate vs. significant other) and opportunities to continue to engage in activities and attending to personal health during the pandemic. Several studies have demonstrated that certain behaviors such as increased phone use, decreased physical activity, and reduced in-person social interaction among U.S. college students during the pandemic are associated with higher rates of depression and anxiety.[24,25] Although published literature on these associations as it pertains specifically to medical students is limited, perhaps students who were more physically active or spent more time with family during the transition to virtual-only learning fared better than peers who did not.

These study findings should be interpreted in the context of several limitations. While the response rate was moderate, it was likely influenced by responder bias. Notably, the survey was completed by a greater number of female, rather than male or non-binary, students. In addition, it was conducted at a single U.S. allopathic medical school and as such, the data may be less generalizable. As is inherent with quantitative survey research, questionnaire design may have contributed to oversimplification of participant lived experience. Another limitation was that our modest sample size prevented more sophisticated statistical analysis and limited the number of comparisons possible; e.g., differential effects by class year and race. Finally, because this is a cross-sectional study, associations are correlational and directionality cannot be determined. Given the nature of the pandemic, no control group could be established and therefore external comparisons in this special population are restricted.

This cross-sectional study demonstrates high rates of adverse pandemic-related experiences in medical students during the COVID-19 pandemic. It joins the small but growing reports of worsening medical student anxiety, depression, and PTSD during this time. To our knowledge, this is the first study to examine pandemic-related experiences in a medical student population using a tool designed to assess specific changes across life domains due to COVID-19. It underscores the need for medical school administrators to be responsive and proactive in addressing the growing concern of psychosocial impairment among medical students. Potential improvements might include free, or reduced cost, ready access on-campus mental health services, adjustment in the medical curriculum to lower student stress, and encouragement of peer support.

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Original Article

Pocket Size Ultra-Sound versus Cardiac Auscultation in Diagnosing Cardiac Valve Pathologies: A Prospective Cohort

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Abstract

Background: Pocket-size ultrasound devices are used to perform focused ultrasound studies (POCUS). We compared valve malfunction diagnosis rate by cardiac auscultation to POCUS (insonation), both conducted by medical students. **Methods:** A prospective cohort study was conducted among subjects with and without clinically relevant valve dysfunction. Inclusion criteria for subjects with a clinically relevant valve dysfunction was based on the presence of at least one moderate severity valve pathology identified by echocardiography. Three final-year medical students examined the patients. Each subject underwent auscultation and a POCUS using a pocket-size ultrasound machine. Sensitivity and specificity were calculated. **Results:** The study included 56 patients. In 18 patients (32%) no valve pathology was found. Nineteen patients (34%) had at least two valvular pathologies. Sixty valve lesions were present in the entire cohort. Students' sensitivity for detecting any valve lesion was 32% and 64% for auscultation and insonation, respectively, and specificity was similar. The sensitivity for diagnosing mitral regurgitation, mitral stenosis, and aortic regurgitation rose significantly by using POCUS compared to auscultation alone. When using POCUS, students identified valvular pathologies in 22 cases (39%) from the patients with at least two valve dysfunctions, and none when using auscultation. **Conclusions:** Final-year medical students' competency to detect valve dysfunction by performing cardiac auscultation is poor. Cardiac ultrasound-focused training significantly improved medical students' sensitivity for diagnosing a variety of valve pathologies.

Key Words: Auscultation; Diagnosis; Insonation; Medical students; Pocket ultrasound device; Point-of-care ultrasound; Valve disease (Source: MeSH-NLM).

Background

For the last almost 200 years, physical examination has been based on inspection, percussion, palpation, and auscultation. The physical examination is immediate, does not require any special technological equipment, and is a part of the early stages of medical students training. However, the diagnostic accuracy of the physical examination is low, at least for a significant number of cardiac pathologies, even among specialists.[1-4]

Improvements in technology have enabled the development of small ultrasound devices with high resolution. These miniature devices can be used to perform focused ultrasound studies, termed point-of-care ultrasound (POCUS), as an extension of the physical examination for the diagnosis of cardiac as well as lung and abdominal pathologies after brief training.[5-11] Robust data has been collected for the last fifteen years showing the benefits of adding POCUS to the physical examination in the diagnosis of cardiac pathologies performed by medical students, residents, non-cardiologist physicians, and cardiologists.[12] Furthermore, using POCUS, medical students were able to better diagnose cardiac diseases compared to cardiologists with vast experience who conducted a physical examination based on cardiac auscultation.[11] Stokke et al. demonstrated that 21 medical students improved their diagnostic rate of clinically relevant valvular lesions (from 49% based on auscultation and 64% based on POCUS) after only four hours training in cardiac ultrasound.[13] As such, ultrasound is gradually being incorporated into the curriculum of medical schools worldwide.[14] Finally, insonation, meaning "exposure to or the use of ultrasound", has been proposed to become the fifth pillar of the physical examination after inspection, percussion, palpation, and auscultation.[15]

To date, assessment of the additional value of insonation for diagnosing left-sided valvular dysfunction has been evaluated on patients with single valvular lesions.[3] In the current study, we aim to compare auscultation to insonation in the diagnosis of valve malfunction in a population in which some patients had multiple valve lesions, performed by medical students after a relatively short training in cardiac ultrasound. We hypothesized that insonation will outperform auscultation in the diagnosis of valvular pathologies.

Methods

Study population.

Three students in their final year of medical school received twelve hours of training on the operation of a pocket-size ultrasound device (PUD) in order to diagnose common valve disorders. The three students were part of a pilot study with the purpose of evaluating the convenience of implementing this type of course as part of a one-week clerkship in cardiology. The students were not picked by their performance or by their grades but rather arbitrarily. The training process took place in a series of two-hour sessions over the course of approximately a month, beginning with a one-hour lecture on the physics of ultrasound, cardiac ultrasound anatomy, and the examination technique. Next, there was a three-hour bedside-guided lesson on main cardiac ultrasound views, identifying anatomic points, and a two-hour review of normal and abnormal echocardiographic cases focused on valve pathologies in the echocardiography lab. These were followed by one hour of hands-on exercise using PUD under the guidance of an echocardiography technician and seven additional hours of practice on volunteer healthy subjects. Prior to the initiation of the study, the students listened to sound characteristics of murmurs on a

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The students were proficient in cardiac auscultation that had been taught in the previous years and had used it as part of the physical examination they performed in different teaching scenarios during the last three years of the medical school.

The session on auscultation was an hour long and focused on the recognition of the individual pathologies and the characteristics that allow the examiner to differentiate pathologies that cause systolic and diastolic murmurs. The auscultatory skills of the students were not assessed prior to the initiation of the study.

The recruitment of subjects was conducted through the Cardiology Section at Soroka Medical Center. Recruitment was based on the presence of at least one valve pathology of at least moderate severity identified on recent echocardiography study that was required for clinical reasons. A control group of subjects without valve disease was recruited as well and was matched by gender and age. Echocardiography is the most efficient tool to diagnose valve disease; accordingly, we use it as the gold-standard method to compare students' ability to diagnose valve disease and rather than the physical examination of expert clinicians which, when based on auscultation, can misdiagnose almost half of the clinically significant valve diseases.[2, 11, 12]

The nature of the study and the examinations were explained to all research subjects. A signed informed consent was obtained from all subjects. The study was approved by the local ethics committee.

The device.
The miniature device used was the General Electric Vscan ultrasound device, measuring 28 × 73 × 135 mm. The combined weight of the device and transducer is 390 grams. The monitor of the device is 3.5 inches wide, with a resolution of 320×240 pixels, and provides two-dimensional and conventional color Doppler, but lacks spectral Doppler. The device is able to save still images and videos in a flash-card memory.

Data collection.
The students, who were unaware of the echocardiography results, performed two examinations on each subject: first a physical examination that included cardiac auscultation, the results of which were recorded on an examination form. Next, the subjects underwent a POCUS performed with the miniaturized device, and the test results were documented on the examination form (same form as auscultation reports) that noted whether any disorder of the mitral valve or the aortic valve (regurgitation or stenosis) had been found. This sequence was chosen in order to avoid influence of the results of POCUS on the auscultation results. The students were notified that patient may or may not have multiple valves lesions. The three examiners were blinded to the results of their classmates and were alone while performing the examinations on the subjects. The studies were conducted within two months from the first patient enrollment. Demographic and clinical data and standard echocardiogram results were taken from the computerized hospital files of the subjects.

Statistical analysis.
The data were processed with SPSS version 18 software. The demographic and clinical characteristics of the study population were described. The categorical variables were described by percentage and number. The quantitative variables were presented by mean and standard deviation, and the nonparametric variables were described by median and range.

Sensitivity was defined as the percentage of subjects correctly identified by the student as suffering from a valve disorder. Specificity was defined as correct identification of the absence of valve pathology. The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of the POCUS findings were calculated, against the echocardiographic study carried out by an experienced examiner. The kappa test was used to assess the degree of agreement between the findings of the POCUS and the findings of the echocardiography study for each of the students, with a value above 0.6 considered good agreement and a value above 0.8 considered very good agreement.
In order to address the question of which factors are more accurate predictors (of pathology or absence of pathology) in POCUS compared to physical examination, an ordinal generalized estimating equation (GEE) model was used. The definition of effect of the model is as follows: -1 – Physical examination provides more accurate identification (of pathology or absence of pathology); 0 – There is no difference between POCUS and physical examination in terms of identification (of pathology or absence of pathology); +1 – POCUS provides more accurate identification (of pathology or absence of pathology).

In the performance of the model, adjustments were made for tests conducted on the same patient, as well as by the same operator. Variables with two-sided p-value ‹ 0.1 in the univariate analysis or as clinically relevant were introduced into the multivariate analysis including age, body mass index (BMI), gender, type of valve pathology, and severity. A two-sided p-value ‹0.05 was considered significant.

Sample size considerations were as follows: according to the study hypothesis, echocardiography has better sensitivity and specificity of finding valve pathology, in comparison to basic physical exam using stethoscope. Basic physical exam sensitivity and specificity is approximately 50%. We assume that echocardiography sensitivity and specificity is at least 80%. Under estimation of alpha (two-sided) ‹0.05 and 80% power, the group of patients with any valve pathology should include 40 patients, with similar group size without valve pathology.

Results

The study included a total of 56 subjects who were examined by the three medical students. The characteristics of the subjects are presented in **Table 1**. Of the total number of subjects, 18 had no valve pathology and 38 had at least one moderate valve pathology, 19 of them having more than one valve malfunction. The following pathologies were identified by echocardiography among the 38 subjects with valve dysfunction: mitral regurgitation (MR): 28 cases (15 mild, 8 moderate, 5 severe); mitral stenosis (MS): 4 cases (2 moderate, 2 severe); aortic regurgitation (AR): 18 cases (10 mild, 7 moderate, 1 severe); aortic stenosis (AS): 10 cases (5 moderate, 5 severe); a total of 60 findings among the 38 subjects with any valve dysfunction. Based on POCUS, students improved their diagnostic sensitivity of the 60 cases of valve dysfunction by 50% without significant change in the specificity (***Table 1***).

3.1 Medical students' skills for diagnosing valvular dysfunction

3.1.1 Mitral valve regurgitation (MR): The students improved their ability to detect 28 cases of MR by 15% when they based their diagnosis on POCUS (from 45% to 60% for physical exam and POCUS, respectively), with concomitant improvement in specificity of 14% (***Table 2***). The accuracy was 69% and 55% for insonation and auscultation, respectively. Even when considering only the cases of moderate and severe MR (13 cases), POCUS demonstrated superiority to auscultation, so that the average ability to identify MR of moderate and severe levels improved by 20% with POCUS (74%) compared to auscultation (54%).

3.1.2 Mitral valve stenosis (MS): 12 exams were performed on 4 subjects with moderate and severe MS. Sensitivity rates rose considerably when students based their diagnosis on insonation (from 8% by auscultation to 92% by POCUS), with only a slight drop in specificity value (95% and 86% for auscultation and POCUS, respectively), with an average kappa value of 0.53 (***Table 2***). The accuracy was 87% and 89% for insonation and auscultation, respectively.

3.1.3 Aortic valve regurgitation (AR): The accuracy of the medical students in diagnosing the 18 cases of AR by auscultation was remarkably poor. By auscultation, students identified 6% of cases of AR and improved by POCUS (31%) with a fall in specificity (95% and 78% for auscultation and POCUS, respectively) (***Table 3***). The accuracy was 63% and 67% for insonation and auscultation, respectively. Students' diagnostic rate by auscultation in the 8 cases of moderate and severe AR was also reported, with a sensitivity of 4% which rose to 39% based on POCUS.

Table 1. Baseline Characteristics of Subjects (n=56).

Variable	Categories		n (%)
Age (mean ± SD)			61.6±13
Gender	Male		35 (62.5)
BMI (mean ± SD)			27.6±4.8
BMI	≤30.0		42 (76.4)
	30.1-35.0		8 (14.5)
	35.1-40.0		5 (9.1)
Pathology	LV systolic dysfunction		17 (30.4)
	Rheumatic injury		5 (8.9)
	Calcified aortic valve		17 (30.4)
	Bi-cuspid aortic valve		0 (0)
	AS	mild	0 (0)
		moderate	5 (8.9)
		severe	5 (8.9)
	AR	mild	10 (17.9)
		moderate	7 (12.5)
		severe	1 (1.8)
	Mitral valve prolapse		1 (1.8)
	MS	mild	0 (0)
		moderate	2 (3.6)
		severe	2 (3.6)
	MR	mild	15 (26.8)
		moderate	8 (14.3)
		severe	5 (8.9)

Legend: AR – Aortic regurgitation, AS – Aortic stenosis, LV – Left ventricle, MR – Mitral regurgitation, MS – Mitral stenosis

3.1.4 Aortic stenosis (AS): Ten subjects had moderate (5 subjects) and severe (5 subjects) AS, which was the pathology that students identified best by auscultation among the 4 valve dysfunctions they investigated (sensitivity 67%, specificity 89%). However, better sensitivity (70%) was demonstrated by POCUS, with only a slight drop in specificity (87%). The accuracy was 82% and 85% for insonation and auscultation, respectively. It should be noted that with the use of POCUS, a wide range of the level of sensitivity among the three students was apparent, seen as well with auscultation (***Table 3***).

3.1.5 Combined valvular dysfunction: More than one pathology was found in 19 subjects (MR + MS = 5, MR + AR = 8, MR + AS = 2, AR + AS = 4). Of the 57 cardiac auscultation examinations on subjects with combined pathology, none was detected by auscultation. On the other hand, 22 such cases were correctly identified by POCUS (39%). Notably, the combined pathologies of the mitral valve (MR + MS) were identified best, so that of 15 examinations, 13 (87%) such cases were correctly identified by POCUS. Of all cases with combined aortic pathology (AS and AR), none was detected by the students by either of the two diagnostic methods.

3.2 Factors that influence more accurate identification of valvular dysfunction by POCUS compared to cardiac auscultation

3.2.1 Related to valve pathology. The ability of the students to correctly identify by POCUS the presence or absence of MR that was missed by auscultation (27%) was clearly superior to the correct identification of MR by auscultation that was missed by POCUS (8%). On the other hand, the ability of auscultation to identify the presence or absence of AR that was missed by POCUS (15%) was slightly superior in comparison to the correct identification by POCUS missed by auscultation (11%). The ability to correctly identify by POCUS the presence or absence of MS and AS that was missed by auscultation (9% and 10%, respectively) was the same as the correct identification of MS and AS by auscultation that was missed by POCUS (9% and 10%, respectively).

3.2.2 Related to the examiner. Variance for arriving at a correct diagnosis by auscultation and POCUS was observed between the three examiners, with a range of 10–18% of cases in which identification by POCUS was more accurate than by auscultation and 5–17% of the cases in which identification by auscultation was more accurate than by POCUS. Among the three examiners, in most cases there was agreement in the assessment between both methods of diagnosis (66–84% of cases).

Table 2. Students' Diagnosis of Mitral Pathology.

	Average				Student 1				Student 2				Student 3			
Parameter	MR (n=28)		MS (n=4)		MR (n=28)		MS (n=4)		MR (n=28)		MS (n=4)		MR (n=28)		MS (n=4)	
	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation
Sensitivity, %	60	45	92	8	64	64	100	25	44	29	75	0	71	43	100	0
Specificity %	79	65	86	95	82	39	77	90	81	89	90	96	75	68	92	98
PPV, %	74	60	45	6	78	51	25	17	71	73	60	0	74	57	50	0
NPV, %	67	54	99	93	70	52	100	94	58	56	98	93	72	54	100	93
Accuracy, %	69	55	87	89	73	52	79	86	62	59	89	89	73	55	93	91
Kappa (p-value)	0.39	0.11	0.53	0.02	0.46 (<0.001)	0.04 -0.783	0.32 -0.001	0.13 -0.338	0.25 -0.049	0.18 0.093)	0.64 (<0.001)	-0.05 -0.69	0.46 -0.001	0.11 -0.408	0.63 (<0.001)	-0.03 -0.78

Legend: MR – Mitral regurgitation, MS – Mitral stenosis, NPV – Negative predictive value, PPV – Positive predictive value
* Kappa values < 0 indicating no agreement, 0–0.20 poor, 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 good, and 0.81–1 very good agreement

Table 3. Students' Diagnosis of Aortic Pathology

Parameter	Average				Student 1				Student 2				Student 3			
	AR (n=18)		AS (n=10)		AR (n=18)		AS (n=10)		AR (n=18)		AS (n=10)		AR (n=18)		AS (n=10)	
	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation	POCUS	Auscultation
Sensitivity, %	31	6	70	67	33	6	30	60	31	7	100	50	28	6	80	90
Specificity, %	78	95	87	89	58	92	83	80	89	97	93	93	87	97	85	93
PPV, %	44	42	52	59	27	25	27	40	56	50	75	63	50	50	53	75
NPV, %	70	68	93	93	65	67	84	90	75	69	100	90	70	69	95	98
Accuracy, %	63	67	82	85	50	64	73	77	72	68	89	86	68	68	84	93
Kappa (p value)	0.1	0.01	0.49	0.53	-0.08 (-0.53)	-0.03 (-0.751)	0.12 (-0.363)	0.34 (-0.009)	0.23 (-0.069)	0.04 (-0.582)	0.82 (<0.001)	0.47 (<0.001)	0.17 (-0.182)	0.04 (-0.582)	0.54 (<0.001)	0.77 (<0.001)

Legend: AR – Aortic regurgitation, AS – Aortic stenosis, NPV – Negative predictive value, PPV – Positive predictive value
***** Kappa values < 0 indicating no agreement, 0–0.20 poor, 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 good, and 0.81–1 very good agreement

3.2.3 Related to the severity of the valve dysfunction. The ability to correctly identify by POCUS the presence of moderate valve dysfunction that was missed by auscultation (38%) was clearly superior to the correct identification of moderate valve dysfunction that was missed by POCUS (2%). Similarly, advantage of POCUS over cardiac auscultation was noted for the cases of severe dysfunction: by POCUS, students correctly identified 34% of severe cases of valve dysfunction lost by auscultation, and auscultation resulted in a correct diagnosis in 13% of severe valve dysfunction missed by POCUS. It should be noted that there is no advantage for POCUS when identifying absence of pathology: 12% superiority of cardiac auscultation compared to 7% superiority with POCUS.

3.2.4 Univariate and multivariate analysis: In a univariate analysis POCUS testing demonstrates superiority in the accurate identification of MR as opposed to AS (presence or absence of pathology) vs. auscultation (OR 2.78, 95% CI 1.56–4.95, p = 0.001). However, in a multivariate analysis (***Table 4***) there was no statistical superiority of POCUS to cardiac auscultation for a more accurate identification (presence or absence) for any sub-group of valve pathology. The previous model was further adjusted for BMI and age. It is apparent that superiority exists for POCUS in females compared to males (OR 1.56, 95% CI 1.04–2.32, p = 0.030). In addition, POCUS has superiority in identifying presence of valvular dysfunction of all levels of severity compared to accurate identification of the absence of malfunction (for mild pathology: p = 0.009, OR 2.76; for moderate pathology: p <0.001, OR 6.73; for severe pathology: p = 0.001, OR 4.15).

Table 4. Multivariate Analysis (Ordinal Generalized Estimating Equation) for Accurate Diagnosis by POCUS (Pathology or Normal Valve) vs. Physical Exam.

p value	95% CI	OR	Variable	
0.295	0.97-1.01	0.99	Age	
0.795	0.96-1.04	0.99	BMI	
0.03	1.04-2.32	1.56	Gender (with male as reference group)	
0.217	0.47-1.19	0.75	AR	Pathology sub-type (with AS as reference group)
0.222	0.79-2.76	1.48	MR	
0.52	0.73-1.86	1.17	MS	
0.009	1.29-5.91	2.76	mild	Pathology severity (with no pathology as reference group)
<0.001	3.62-12.53	6.73	moderate	
0.001	1.83-9.43	4.15	severe	

Legend: AR – Aortic regurgitation, AS – Aortic stenosis, BMI – Body mass index, MR – Mitral regurgitation, MS – Mitral stenosis
*Outcome defined as ordinal variable: +1 if POCUS superior to physical exam, 0 if POCUS = physical exam, and -1 if POCUS inferior to physical exam.

Discussion

Our study demonstrates that when students based their diagnosis of valve dysfunction on cardiac auscultation, their performance was poor (mean sensitivity 32%, mean specificity 86%), particularly for identifying valve pathologies that cause a diastolic murmur (mean sensitivity 7%, mean specificity 95%). Students noticeably improved their diagnostic ability with the use of POCUS (mean sensitivity 64%, mean specificity 83%). However, the accuracy rate remains unchanged between auscultation-based and insonation-based diagnosis of the left-side valve lesions, except for MR in which insonation has better sensitivity, specificity, and accuracy than auscultation. It is obvious that auscultation's specificity can be outstanding if the sensitivity of the method is so low. These data on the diagnostic rate of cardiac auscultation are similar to the results of historical studies that exist in the field, and have not improved for the last two decades, despite the fact that the innovative methods based on high quality audio and self-study techniques are widely available.[1-3] In a multicenter study, Vukanovic-Criley et al. showed that physicians not only do not improve their cardiac physical examination after graduation from medical school but probably even show a decline in this skill.[12] Hence, our students were in the best position to succeed with cardiac auscultation.

A serious concern which arises from our study as well as from a study by Stokke et al. is that even when testing only moderate or severe valve dysfunction, students' diagnoses were poor when relying on cardiac auscultation (mean sensitivity 35%) and improved considerably using POCUS (mean sensitivity 70%).[13] POCUS showed remarkable advantage over auscultation for identifying valve regurgitations, especially MR and AR. When considering only the moderate and severe cases of MR there was a 34% improvement in sensitivity between "sound"-based and "ultrasound"-based diagnosis, as well as in the specificity. The advantage of using POCUS is stronger in an isolated analysis of moderate and severe levels of AR, which shows an improvement of 97% in sensitivity in examination with POCUS vs. cardiac auscultation, but the specificity falls considerably when based on POCUS; therefore, the accuracy remained unchanged. Both, MR and AR are diagnosed by color Doppler, available in the portable device used by our students. The regurgitant jet of MR that empties into the large cavity of the left atrium is much more visible than the AR jet that goes back into a small cavity like the left ventricular outflow tract. This fact may explain, at least partially, the different accuracies of the students by insonation for diagnosing MR and AR. This problem probably could be solved by a longer period of training in POCUS.

In addition, an apparent advantage of the use of POCUS over cardiac auscultation is the ability of POCUS to detect several existing

pathologies simultaneously. None of the cases with multiple pathologies were detected by auscultation by any of the examiners. In contrast, with the use of POCUS, 39% of the cases with multiple pathologies were identified. This capability is even more pronounced in the identification of mitral valve pathologies, in which 87% of the cases of multiple pathologies were identified by POCUS.

The improved ability of the students to correctly recognize valve pathology by POCUS was dependent on several parameters. First, we found variation according to pathology type: the improved diagnosis with POCUS was remarkable for MR, whereas for AS and MS there was no improvement. The pocket device used in our study lacked spectral Doppler, which made it impossible to measure flow velocities, making the identification of valve stenosis challenging. It is possible that the ability to diagnose MS and AS would be further enhanced by the presence of an echo device with spectral Doppler capability. Improvements and rapid advances in technology are evolving which will aid in bridging this technical gap and spectral Doppler capability is already included in new pocket ultrasound devices. Second, POCUS was significantly superior to cardiac auscultation for pathology recognition, in any severity, but inferior for correctly diagnosing the presence of normal valve. The non-superiority of POCUS over auscultation in the correct diagnosis of normal valve function may be affected by the very low sensitivity of auscultation to identify valve pathology. It is also probable that our students were committed to finding cardiac pathology using the new diagnostic method, which could have impacted on their relatively low specificity over auscultation to identify normal valves.
Finally, we found significant variability among the three students in their diagnostic accuracy for both diagnostic modalities, probably due to different personal learning curves. Even though in most cases correct identification of the presence or absence of valve pathology was done by POCUS and auscultation, it was observed that there were more cases correctly diagnosed only by POCUS than cases correctly diagnosed by auscultation only. Our students received eight hours more of training than Stokke's students (four hours training), however the results were similar between studies.[13] It is likely that the number of hours that the students spent on training was the same because Stokke students were encouraged to participate in a pre-course online training that included normal and pathologic echocardiography studies, as well as main cardiac ultrasound views and maneuvers to obtain the images.[13] The ultrasound training that the students received was short when compared to lessons on cardiac auscultation, and their experience using ultrasound for diagnosis was significantly less than their three years of experience using a stethoscope. In other words, it seems that the learning curve of ultrasound is shorter than that of cardiac auscultation. Implementation of ultrasound techniques in the curriculum of medical students in pre-clinical years may improve their diagnostic capability based on ultrasound in the near future.[14] In our medical school curriculum, POCUS education is integrated along the clinical years. The students are being tested on their performance of cardiac ultrasound, as well as on lung, vascular, and the focused assessment with sonography for trauma (FAST) exam. They are also tested during their clinical years on their physical examination, including cardiac auscultation. We believe that POCUS can be used as an instrument to improve auscultatory skills by providing immediate confirmation or rejection of the auscultatory findings. This feedback is essential for the learning process.

The main barriers of incorporating POCUS into the medical school curriculum include time that is added into the demanding curriculum for a new course, the necessity of sufficient instructors to teach a growing number of students in small groups, and financial issues related to the cost of the ultrasound devices and cost of the instructions' teaching time.[14] Our experience has demonstrated that some of these limitations can be overcome by incorporating students as instructors of their classmates and students' self-learning by web-based POCUS modules.[16, 17] There are unresolved issues of ultrasound education in medical schools, such as duration of the instruction and knowledge retention at the final year of the medical school.[18, 19] The introduction of ultrasound in the preclinical years, its teaching in clinical courses and clinical rotations, and testing in practical exams could reinforce further knowledge retention.

A major limitation of this study is the small operator sample size, including only three medical students that conducted the POCUS examination and the auscultation. Although they examined only 56 patients, different valve pathologies were examined in each patient (aortic valve stenosis and regurgitation, mitral valves stenosis and regurgitation) with a total of 60 pathologies that were found among 38 patients. The students were not picked by their performance or by their grades but rather arbitrarily. The results we present should be considered in the context of pilot study results, and larger studies should be conducted to confirm the results of this study. Another limitation relates to the imaging quality of POCUS examination that was not graded. However, none of the recruited subjects were discarded from the analysis due to poor POCUS imaging. Finally, the three students in the study were recruited based on their willingness to participate in a research project; we did not assess their diagnostic skills prior. They received the same instructions, and we cannot explain the differences in students' results, other than by differing amounts of time spent by each of them on self-practice.

Conclusions

Final year medical students' cardiac auscultation skill for the detection of moderate and severe valvular dysfunction is poor. A concise cardiac ultrasound training allows medical students to improve their valvular pathology diagnostic capability significantly. POCUS is also significantly better in the diagnosis of a combination of valve malfunctions in the same patient when compared to auscultation. The results we present should be considered in the context of pilot study results, and larger studies should be conducted to confirm the results of this study.

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Author Contributions

Conceptualization: LZ, TM, TS, YF, LB, NLC, SLK; Data Curation: TM, TS; Formal Analysis: TM, TS, LB, NLC, SLK; Investigation: LF, TM, TS, YF, LB, SLK; Methodology: TM, TS; Project Administration: LZ, LB; Resources: TM, TS, LB; Supervision: LZ, LF, SLK; Validation: TM, TS; Visualization: LZ, LF, TM, SLK; Writing – Original Draft Preparation: LF, TS, YF, NCL, SLK; Writing – Review & Editing: LZ, LF, TM, TS, YF, LB, NLC, SLK.

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Short Communication

Med Moth: A Storytelling Platform for Improving Wellness in Medical Education

Michelle Silver,[1] Sarah Ohnigian,[2] Hugh Silk,[3] Michael Ennis,[4] Judith Savageau.[5]

Abstract

Background: Burnout is a major issue amongst medical students and professionals that demands a solution. Mindfulness has been shown to decrease burnout. Storytelling, as a form of mindfulness, leads to reflection. Few publications have studied the effect of storytelling on student and clinician wellness. To address wellness within their medical community and utilize the underexplored method of narrative medicine as a curricular enhancement, the authors designed and implemented a novel storytelling platform, *Med Moth*, at the University of Massachusetts Medical School (UMMS) and associated hospital (UMass Memorial Medical Center). **Methods:** Members of the community were invited to storytelling events to listen to and share stories about formative medical experiences. Four events were held between 2017 and 2018. After each event, participants received a survey inquiring how attendance benefitted them personally and professionally. **Results:** Clinicians, students, and faculty comprised the 104 first-time attendees surveyed. *Med Moth* produced a strong perceived benefit to surrogate measures including emotional exhaustion and depersonalization, defining characteristics of burnout, and professional development. Among these three measures, 66% of participants rated 4-5 (out of 5). Nearly all attendees (96%) rated 4-5 for the overall experience. Lastly, medical students reported a higher benefit regarding professional development than clinicians (p=0.002). **Conclusions:** This pilot study of a novel storytelling platform demonstrates positive personal and professional development outcomes, both during and after medical school training. Medical schools, residency programs, and medical institutions should strongly consider the implementation of such a wellness platform to build resiliency and to mitigate burnout through reflection.

Key Words: Professional Burnout; Medical Education; Mindfulness; Medical students; Curriculum; Health promotion (Source: MeSH-NLM).

Introduction

Clinicians and medical students face high rates of stress and burnout.[1-3] These symptoms adversely affect mental health and manifest as depression, anxiety, and fatigue.[4] In a recent study of 4,000 US medical students, 49% reported signs of burnout.[1] Depression is also more common among medical students and residents than the general population.[4] These issues are not only deleterious to the health of medical providers, but also to their patients.[4]

Burnout is unequivocally present among medical students and professionals and requires a solution. Mindfulness can decrease burnout and improve depression and anxiety. It can also cultivate compassion, empathy, and personal and professional identity development.[6-10] Mindfulness training teaches participants to approach lived experiences in an introspective way. Reflective practice is one application of mindfulness. It leads to understanding one's beliefs and values in the context of one's colleagues and patients. Medical students who engage in reflection display more mature thinking, certainty with professional choices, and report a positive learning experience.[11]

Storytelling is an excellent means of reflective practice, allowing one to be present, compassionate, and deepen community connections. A recent article by Perri Klass entitled "Morality Tales" discusses the trend toward medical humanism with students and residents increasingly "tak[ing] time to consider and describe the complex aspects of medical stories that get left out of the formalisms of the medical record."[12] Outside of medicine, storytelling is well-established. Novelist George Green embraced its impactful nature when creating The Moth, an internationally acclaimed storytelling organization.[13]

There are only a few studies that have directly assessed the effect of storytelling on student and clinician burnout. One study showed that medical students who participated in storytelling sessions with peers demonstrated an increase in the empathy score.[14] Other published accounts of storytelling's effect on clinician burnout are mainly personal experiences of physicians who cite benefits such as improved patient relationships and collegial communication.[15]

To address burnout within our medical community, we created a novel storytelling opportunity at UMass Medical School (UMMS) and associated hospital (UMass Memorial Medical Center). Inspired by The Moth, *Med Moth* was created to provide a platform for members to listen, share, and reflect. *Med Moth* was created to positively impact personal wellness and professional development through sharing clinical perspectives and experiences. We aimed to identify individual characteristics that correlate with a higher impact of this platform.

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**Research was conducted at the University of Massachusetts Medical School prior to the graduation of first and second authors, who are now listed with their current institutional affiliations*

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Methods

Participants (attendees and speakers) were members of the UMMS community, including medical students, nursing students, clinicians, faculty, and administrators. Participants were recruited via Facebook, student events, web-based school news outlets, posters, and listservs.

We held four, 1.5-hour events (March 2017 to October 2018), each with 8 to 10 speakers. Stories were prescreened for protected patient information. Speakers shared poetry or prose with topics ranging from clinical mistakes, "why medicine", to comedic misunderstandings with patients. Refreshments were provided.

Using web-based data collection (Google Forms, Google LLC, Mountainview, CA), we emailed the survey three days after an event as a group message to all recipients who signed-in to the event. Participants were able to see all recipients of the email. Regarding the survey, multiple choice and free text questions characterized attendees by demographics and traits. This included affinity toward storytelling and an hourly breakdown of work, study, exercise, and other commitments. Likert-scaled questions, ranging from 1 (a little) to 5 (a lot), assessed the degree of positive effect of attending Med Moth on two domains of interest: personal wellness and professional benefit. Personal wellness was divided into emotional exhaustion and depersonalization (based on the Maslach Burnout inventory), and professional benefit assessed how events would influence clinical practice.[3] Where appropriate, we combined categories of 'often' and 'very often' and reported as $mean_{often/very\ often'}$, and the same for 'never' and 'sometimes' response options. The study was approved by the UMMS Institutional Review Board.

Using SPSS statistical software (SPSS v.23, IBM Corporation, 2015), survey questions on emotional exhaustion, depersonalization, and professional benefit were analyzed using chi-square tests, student t-tests, correlations, and non-parametric equivalents for ordinal data. We used cumulative scores across all questions within a category (e.g., the two 5-point questions for emotional exhaustion yielded a maximum score of 10). We reported average scores per question to demonstrate trends.

We assessed relationships influencing the impact of *Med Moth*, including the level of training and participant characteristics. For each question, analyses were conducted across all three domains. For select analyses, original Likert scale responses were dichotomized for bivariate analyses. We used survey responses from first-time attendees only and excluded subsequent responses in the current analysis. We combined responses from residents and mid-level practitioners (e.g., nurse practitioners) with attending physicians to compare medical students to clinical practitioners.

Results

Med Moth experienced a growing number of attendees (41 participants in March 2017; 85 in October 2018): 236 total attendees, including 175 first-time attendees. There were 151 survey responses (64% response rate). Analyses representing 104 surveys from first-time attendees showed a larger proportion of females, medical students, primary care, and senior clinicians (***Table 1***).

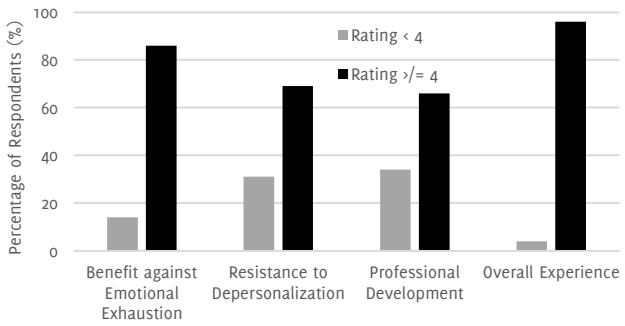
Nearly all first-time attendees (96%) endorsed a high overall experience rating of 4-5 out of 5. Perceived benefits in emotional exhaustion, depersonalization, and professional development were strong; two-thirds (66%) of participants reported high ratings of 4-5 out of 5. Most (92%) reported they would "definitely" attend another event (***Figure 1***). Medical students reported a significantly higher benefit for professional development compared to clinicians (p=0.002; ***Table 2***). Across all other measures, there were equally positive responses between groups.

Table 1. Demographic Characteristics of 104 First-Time Participants who Attended a *Med Moth* Storytelling Event at the University of Massachusetts Medical School, 2017-2018.

Variable	Clinical Faculty*	Medical Students	Non-Clinical Faculty
n (%)	29 (27.8)	66 (63.5)	9 (8.6)
Age, n(%)			
< 30	0 (0)	64 (97)	1 (11.1)
30-49	10 (34.5)	2 (3)	4 (44.4)
≥50	19 (65.5)	0 (0)	4 (44.4)
Gender, n(%)			
Female	18 (62)	49 (74.3)	9 (100)
Male	11 (38)	17 (25.7)	0 (0)
Years Practicing, n(%)			
1-10	6 (20.7)		
11-20	7 (24.1)	N/A	N/A
>20	16 (55.2)		
Specialty, n(%)			
Primary Care *(Internal Medicine, Pediatrics, Family Medicine)*	13 (44.8)		
Medicine Subspecialty	2 (6.7)		
Psychiatry	2 (6.7)	N/A	N/A
Surgery	1 (3.4)		
Radiology	1 (3.4)		
Other/Blank	10 (34.5)		

Legend: *Medical Doctor, Nurse Practitioner, Registered Nurse, Physician Assistant, Doctor of Philosophy.

Figure 1. Percentage of respondents (n=104) who, on average, reported scores of <4 versus ≥4 for overall experience and for each of the three domains—emotional exhaustion, depersonalization, and professional development. A higher rating (≥4) reflects a benefit to emotional exhaustion, depersonalization, and professional development, as well as a more positive overall experience. Reports were based on first-time attendance of a *Med Moth* Storytelling event at the University of Massachusetts Medical School, 2017-2018.



Participants who frequently sought storytelling outlets outside of *Med Moth* reported a greater personal benefit of attending the event. Specifically, those who often seek storytelling media as a listener or reader reported higher benefit against emotional exhaustion than those who rarely seek this out ($mean_{often/very\ often}$=9.41; $mean_{never/sometimes}$=8.63; t=-2.86; p=0.005; ***Table 2***). Those who sought storytelling as a speaker or writer reported higher benefit against depersonalization ($mean_{often/very\ often}$=15.00; $mean_{never/sometimes}$=12.55; t=-9.59; p<0.001; ***Table 2***). No significant relationships were found with the remaining domains.

Table 2. Comparison of Personal and Professional Benefits between various Subgroups of First-Time Participants who Attended a *Med Moth* Storytelling Event at the University of Massachusetts Medical School, 2017-2018.

Personal Benefit	Average Rating, mean (SD)								
				Story-Seekers			Story-Tellers		
	Medical Students	Clinicians	p	Frequent *often/ very often*	Seldom *never/ sometimes*	p	Frequent *often/ very often*	Seldom *never/ sometimes*	p-value
*Benefit against Emotional Exhaustion *(max. points = 10)*	8.88 (1.72) ***n=66*	8.90 (1.47) *n=29*	0.96	9.41 (0.94) *n=39*	8.63 (1.84) *n=64*	**0.005**	9.00 (2.24) *n=5*	8.92 (1.58) *n=98*	0.91
Benefit against Depersonalization (max. points = 15)	12.75 (2.53) *n=65*	12.33 (2.37) *n=27*	0.46	13.08 (1.88) *n=37*	12.39 (2.72) *n=59*	0.15	15.00 (0.00) *n=4*	12.55 (2.45) *n=92*	**<0.001**
Professional Benefit *(max. points = 10)*	8.21 (1.84) *n=64*	6.60 (2.35) *n=28*	**0.002**	7.68 (2.04) *n=38*	7.83 (2.15) *n=58*	0.75	8.80 (1.79) *n=5*	7.71 (2.10) *n=91*	0.26
Overall Satisfaction *(max. points = 5)*	4.73 (0.57) *n=66*	4.79 (0.41) *n=29*	0.58	4.79 (0.47) *n=39*	4.74 (0.54) *n=65*	0.59	5 (0.00) *n=5*	4.75 (0.52) *n=99*	***0.25

Legend: *indicates maximum score per category: responses were analyzed using the cumulative score across all questions, with a maximum of 5 points per question
**participants were only included in analyses when they answered all sub-questions within a domain, explaining varied n per section
***the non-parametric p value is being shown as this differed significantly from the traditional t-test because of the large difference in variances between the two groups

There were no significant correlations between hours of sleep or self-care hours (exercise, relaxation, hobbies) and *Med Moth* ratings within any domain. However, there were moderately strong correlations between personal and professional ratings for all participants ($r=0.637$, $p<0.001$) and within stratified analyses among medical students ($r=0.680$, $p<0.001$) and clinicians ($r=0.672$, $p<0.001$).

In the open-ended text, participants described many benefits to attending *Med Moth*, including the promotion of optimism, resiliency, admiration, and inspiration. One student wrote: *"Earlier in the day I was feeling tired and burnt out…I needed to remember why I wanted to be a doctor. This event was refreshing, enlightening, fun, and enjoyable. I left with a pep in my step and feeling energized and inspired. It reminded me…there are events like this where we can learn more about each other and take time to reflect and grow"*. Another student commented: *"I often feel an underlying pressure to be perfect in medical school, and it is so powerful to hear the clinicians we aspire to be like also having faced situations that were far from perfect. These sessions have helped me ground my experience and realize that medicine will always be a process.* Two faculty wrote: *This was a new experience for me…one that was enriching and personally gratifying. Hearing the other stories, I was moved by the messaging with emotions ranging from laughter to tears*; and: *I've been at UMMS a little over 2 years, and this is the first time I've really felt connected to the community"*.

Discussion

Responses to *Med Moth* were overwhelmingly positive. Nearly all participants reported a high overall rating and indicated they would return. For emotional exhaustion, depersonalization, and professional development, greater than two-thirds of participants highly-rated the benefit of attending Med Moth. Many attendees commented that the program was inspiring and promoted both optimism and resiliency.

Regardless of role, there was a positive correlation between personal and professional ratings, which emphasizes benefit across all domains. Medical students reported higher benefits for professional development compared to clinicians. More importantly, clinicians and medical students reported a positive impact on emotional well-being and resistance against depersonalization – core features of burnout. Not surprisingly, individuals who seek storytelling outlets demonstrated greater benefits to emotional exhaustion and depersonalization. Overall, *Med Moth* appears to impact all participants on a humanistic and relational level. These findings echo a published systematic review showing that medical students who participate in storytelling sessions with peers demonstrate an increase in empathy scores.[14] Studies on mindfulness further support these sentiments. One study showed that medical students who engage in reflection display more mature thinking, certainty with professional choices and a more positive learning experience with their clinical training.[11] Other studies have demonstrated that mindfulness training improves measures of depression and anxiety, cultivates empathy, and inspires more thoughtful decision-making in medical students and physicians.[8,10] *Med Moth* not only complements existing literature demonstrating the importance of reflection amongst medical professionals but also suggests an impactful and unique solution.

This study is timely; medical humanities are expanding and the need for wellness is now.[5,7-11] Narrative medicine essays about wellness are increasing frequency and relevance in journals such as in The Journal of the American Medical Association (JAMA) and the New England Journal of Medicine. Health policy journals are following suit (e.g., Health Affairs section entitled "Narrative Matters"). The Accreditation Council for Graduate Medical Education (ACGME) now requires every accredited residency program to address well-being "and attend to resident and faculty member burnout [and] depression." Therefore, the application of a platform like *Med Moth* has significant potential in the larger realm of medical education. Barriers to medical storytelling will have to be addressed, including disregard of medical humanities as a valid form of education enrichment, lack of time, and denial of burnout in medicine.

With regards to limitations, our study may lack generalizability (conducted in one school and hospital). Our sample size of 104 limited our ability to conduct detailed subgroup analyses, and the 64% response rate may not reflect all attendees. Voluntary attendance and self-report may have yielded more positive reviews. Furthermore, bias could occur from the medical school being a small community and participants not wanting to be negative towards the student organizers of Med Moth.

Our study serves as a pilot that begins to quantify the benefits of storytelling in medicine. We propose that a more objective and validated study of *Med Moth* and similar storytelling programs in medical communities be conducted. Ideally, data should be collected across multiple medical and health professional schools. Thereby, required storytelling events would increase sample size and generalizability in exploring potential discrepancies between regions and cultures. Future analyses should also assess change-over-time to identify the benefits of attending multiple events.

Conclusively, storytelling events have great potential as curricular enhancement within medical education to help build resiliency and mitigate burnout. Medical institutions should strongly consider the implementation and evaluation of such a platform to produce well-trained clinicians who simultaneously provide empathetic care and also find joy in their work.

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Case Report

Rectovaginal Fistula Due to an Erosive Pessary: A Case Report

Waleed Inayat Mohamed,[1] Dorea Emmanuel,[2] Shahzaib Maqbool,[3] Ali Asad,[4] Asad Jawad,[5] Arham Ihtesham.[3]

Abstract

Background: Pelvic organ prolapse (POP) occurs when pelvic organs protrude through the vagina due to displacement from their normal anatomic position, as a result of a weakening of the pelvic muscles. Pessaries have long been used to treat POP, but they may result in rectovaginal fistulas as a rare complication. **The Case:** We report a rare case of a rectovaginal fistula following vaginal ring pessary use in an 82-year-old G7P7 woman. She had a past medical history of bipolar disorder, and initially presented for nursing care and psychiatric support. A trained psychologist evaluated her, and found no psychological morbidity. A two-day history of a fall, diffuse abdominal pain, and chronic urinary incontinence were rather identified. Gynecological pelvic examination revealed a rectovaginal fistula and impacted stools in the vagina. **Conclusion:** The use of ring pessaries, though a conservative management option for POP, may lead to a rectovaginal fistula, a rare but severe complication.

Key Words: Pessaries; Rectovaginal fistula; Adverse effects (Source: MeSH-NLM).

Introduction

Pelvic organ prolapse (POP) is a common finding in obese elderly women, with 3-6% symptomatic and about 50% clinical prevalence rates.[1-3] Treatment options for POP range from non-invasive pelvic floor exercises and medical management to more invasive surgical options. Vaginal pessary insertion is an inexpensive, helpful, and easy-to-use treatment option for POP with a high success rate.[4] It is the first-line treatment option for women with mild prolapse, frail and elderly women (poor surgical candidates), and women who refuse surgery.[5] Severe complications of pessary use are rare but include rectovaginal fistula,[6-14] vesicovaginal fistula,[15] cervical entrapment, [16] and intestinal obstruction.[17] Few cases of rectovaginal fistula have been reported in the literature. We report a case of rectovaginal fistula, following the use of a vaginal ring pessary in an 82-year-old woman.

Highlights:

- An 82-year-old woman presented with a rare case of rectovaginal fistula.
- The ring pessary insertion can result in the formation of a rectovaginal fistula.
- Due to high success rate and safety profiles of new types of ring pessaries, complications are rare.
- Patients undergoing pessary insertion should be followed up to prevent development of complications.

The case

An 82-year-old G7P7 woman with a past medical history of bipolar disorder presented for nursing care and psychiatric support. A trained psychologist evaluated the patient and found no psychological morbidities. However, a two-day history of a fall, diffuse abdominal pain, and chronic urinary incontinence were identified. A thorough neurological exam revealed that the patient was well oriented in time, place, and person. She had slight reduction in power of upper and lower limbs. The patient was unable to move, and complained of back and abdominal pain. An orthopedic consultation was placed to rule out a vertebral fracture as a fall history was associated with reduced mobility. She had stable vital signs. The orthopedic examination was consistent with reduced power (grade 4). An otherwise unremarkable radiograph of the lumbar spine revealed a ring pessary lying vertically and displaced in the rectum (***Figure 3***).

Gynecological pelvic examination revealed a rectovaginal fistula. Impacted stools were present in the vagina; they were manually removed. No complaints of vaginal or rectal bleeding or other gastrointestinal symptoms were reported. An abdominal/pelvic ultrasonogram was unremarkable. The following day, colonoscopy revealed a low-lying large rectovaginal fistula involving the rectum and anal canal (***Figure 1***). Two large masses were observed—one at the posterior wall of the vagina and the other attached to the rectal wall at the fistula site. A misplaced ring pessary was removed from the rectum. Impacted stools were extracted from the rectum and vagina. Biopsies of the masses were excised and sent for histopathology examination, which revealed the presence of chronic granulation tissues that resulted in a gradual erosion of the gut mucosa and eventually forming a fistula (***Figure 2***). Further questioning revealed that the patient had urinary incontinence secondary to POP that occurred two years ago. At the time, she chose a non-invasive treatment of ring pessary insertion. Follow-up was expected, but an enema was never performed due to patient refusal for a detailed examination and enema. The patient was also incompliant towards regular follow-up visits. The pessary improved symptoms of incontinence initially, but became worse gradually. A management plan was devised to mobilize the patient and proceed with an initial dysfunctioning loop colostomy with a definitive plan of fistula repair and colostomy reversal in subsequent surgeries due to the deteriorated condition of the vaginal tissue. The patient underwent the procedure without complications.

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Figure 1. Colonoscopy Showing Impacted Feces.

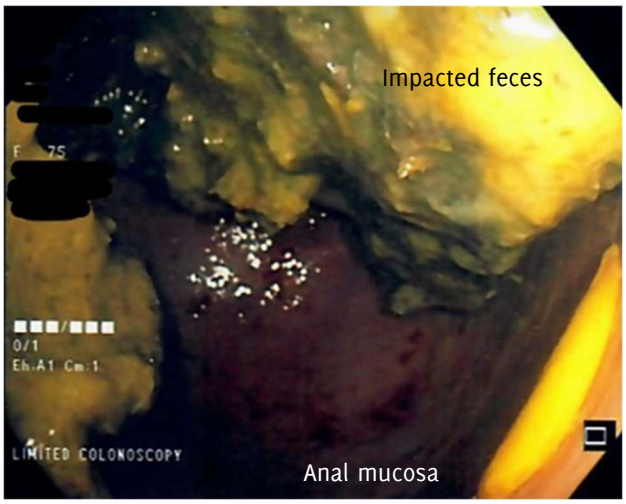


Figure 2. Colonoscopy of Inflamed Mass in Rectovaginal Fistula.

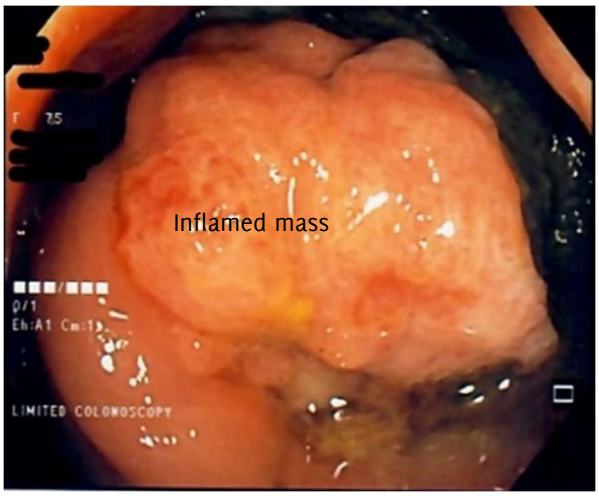
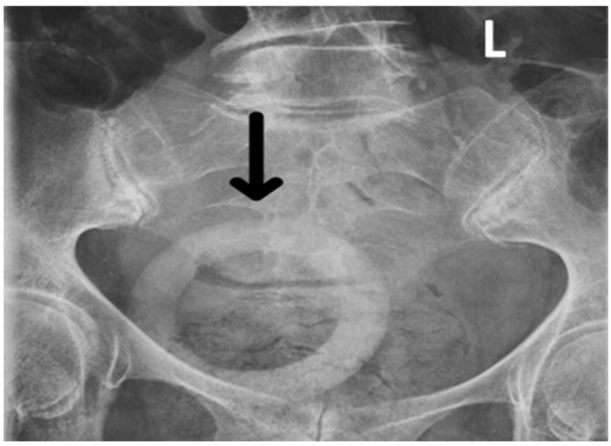


Figure 3. Antero-Posterior View of Pelvic Radiograph Showing Displaced Ring Pessary (Represented by Black Arrow).



The patient stayed at the hospital for nursing care, and was routinely examined for improvement. Stools were occasionally removed from the vagina and rectum. During her stay, the patient suffered from multiple episodes of urinary tract infections (UTIs), which were treated promptly following positive culture reports. The patient stayed at the hospital for three months due to social reasons. A repeat colonoscopy after three months revealed a reduction in size of the chronic granulation tissue and a persistent fistula. Further pelvic examinations revealed the presence of a persistent Grade 2 cystocele with atrophic vaginal walls without ulceration. The cystocele was reduced manually. A subsequent positron emission tomography (PET) scan, which was performed to rule out suspicious rectal/uterine carcinoma, was negative for the presence of a carcinoma. Posterior bladder wall thickening and osteoporosis were appreciated. Due to old age and patient's choice, closure of fistula and reversal colostomy were called off, and the patient was put on a conservative management plan. She was discharged in a stable condition with the provision of continuous nursing support at home. Stoma care was advised. Clean enemas were provided periodically. The patient was under clinical care for almost four months with strict observation. Psychological support and counselling remained consistent throughout patient stay. The patient's consent was obtained to publish this case report.

Discussion

POP is a relatively common finding. About 25% of women in the United States have reported symptoms of pelvic floor disorders, including POP.[2] Pessaries have been considered an effective treatment method for POP, and have been in use for a long time in different forms, ranging from fruits, metals, cotton, to wool.[18] With medical advancement, pessaries are mainly composed of silicon currently; other various types exist.[5] Common complications of pessary use include discharge, bleeding, irritation, and ulceration.[18] Rare complications, such as rectovaginal fistulas, are now more commonly reported in the literature, particularly in older women after 3–5 years of insertion.[6–14] Our patient developed a fistula within two years of insertion, even with regular follow-up visits (but rejecting attempts for enema scans during visits), and experienced no significant symptoms. Detailed gynecological pelvic examination, including an enema, should be performed at each visit to assess the condition and location of the pessary. Pelvic radiography may be added. Proper patient selection, physician awareness, and continuous care post-insertion are the factors that play an essential role in the use of pessary devices. Different treatment options have been used in the past to manage rectovaginal fistulas, including a vaginal estradiol cream, [12] transanal fistula repair, [9] transverse transperineal repair, [8] and a transvaginal approach.[14] The management of such cases begins with careful pessary removal and a detailed physical examination, specifically a gynecological pelvic examination, which paves the way for a definitive management plan. In this case, we planned an initial dysfunctioning colostomy (A dysfunctioning stoma is created in the initial surgery as a temporary diverting pathway. It is subsequently closed when the anastomosis fully heals), which was completed uneventfully. Enough time was given for the inflamed mucosa to heal, with a plan to repair the rectovaginal fistula and reverse colostomy subsequently in the future. Three months post-surgery, the granulation tissues had decreased in size. However, on further discussion with the patient, we decided not to proceed with any further surgical treatment, with consideration of the patient's will, frailty, and potential complications related to the procedures. The patient was advised on continuous nursing and stoma care. Six months post-procedure, the stoma was in a good working condition without any complications.

Recommendations

We recommend the standardization of guidelines on the long-term use of pessaries for POP and treatment of rectovaginal fistula as a complication of pessary use. Regular follow-up after pessary insertion and patient education are essential factors to prevent complications. Patients should be counseled and informed about the rare but serious complication of fistula formation in case of incompliance with follow-ups. The management plan must be tailored towards each patient's need and choice.

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Experience

Raising Gender Equity Voices: Reflections from an International Virtual Assembly in Global Surgery

Letícia Nunes Campos,[1*] Natalie Pawlak,[2*] Lotta Velin,[3] Nensi Melissa Ruzgar,[4] Ayla Gerk,[5] Kevouy Reid,[6] Habab Ali Iraqi,[7] Zineb Bentounsi,[8] Michalina Drejza,[9] Dhrumil Patil,[10] Nour Nassour,[11] Heaven Yeshaneh Tatere,[12] Mehr Muhammad Adeel Riaz,[13] Tanya L. Zakrison.[14]

The Experience

Global surgery is an area of study, research, practice, and advocacy that seeks to improve health outcomes and achieve health equity for all people who need surgical, obstetric, and anesthesia (SOA) care.[1] Even though "global" promotes a spirit of collaboration, the colonial background and long history of gender inequity still influence global health.[2] This is evident by the imbalanced gender and geographic distribution of leadership, where only 17% of global health leaders come from low- and middle-income countries (LMICs), with women representing 5% of this proportion.[3] This pattern extends to global surgery, where women and non-binary gendered people are underrepresented in SOA specialities.[1]

To inform the surgical community and public on gender disparities in SOA fields, the Gender Equity Initiative in Global Surgery (GEIGS) was founded in 2019, based on three pillars: research, mentorship, and advocacy.[4] Given the paucity of open-access learning opportunities on gender equity in surgery, GEIGS and similar organizations show potential for providing such instructional spaces. In light of the COVID-19 pandemic, the adaptation of conferences to virtual platforms has allowed more international colleagues and underrepresented members of the surgical workforce to access educational opportunities.[5]

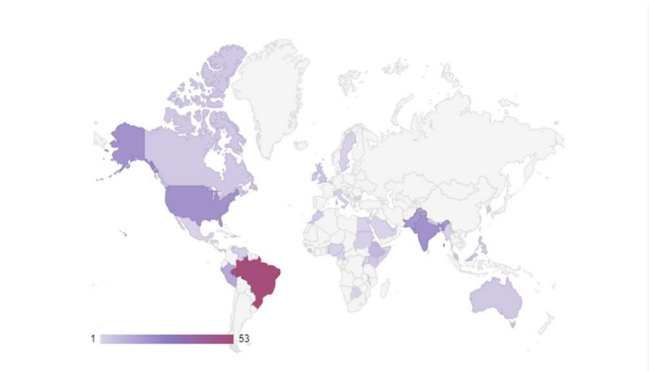
Creating the General Assembly

Aiming to address the gap in open-access gender equity education, GEIGS held its first General Assembly on December 12 and 20, 2020. The agenda were centered on "Building Capacity for Gender Equity in Global Surgery." An organizing committee (OC), formed from an open call to all GEIGS members for volunteers in October 2020, organized the event. The OC comprised 11 individuals, eight of which were females, from nine different countries, including six LMICs. This intersection of diverse perspectives was a crucial component to planning a General Assembly focused on capacity building in a truly global context.

In total, 199 attendees from 46 countries participated in the virtual event; a world map depicting these countries and levels of attendance by country is shown in ***Figure 1***. Stratification of participants using the World Bank income categories shows that 43 (21.6%), 80 (40.7%), 54 (27.6%), and 19 (9.5%) participants were from high income, upper-middle income, lower-middle income, and low-income countries, respectively.[2]

The assembly featured six region-specific networking and capacity building sessions, adopting the World Health Organization regional model.[6] Each focused on a context-specific set of topics and challenges related to gender equity. While few studies have been conducted on the causes of gender disparities within surgical fields in LMICs, the reasons discussed by participants in these sessions echoed those discussed in previous HIC-centric studies, including structural barriers that preserve cisgender male dominance in higher-ranking positions, overt and covert discrimination, and the lack of same-gender mentorship or adequate parental leave policies that could ameliorate this gap.[7]

Figure 1: International Representation at the GEIGS General Assembly.



Legend: This world map depicts the number of registered attendees per country and the different countries that were represented in the GEIGS General Assembly. There were 199 attendees from 46 countries.

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Emerging Themes and Knowledge Gaps

Despite expected differences in attendee perspectives in the regional sessions, overarching themes also emerged. One unifying topic discussed was the exclusion of non-English-speaking experts from academic conferences.[8] Echoing the oppressive colonially-rooted history of global health, many international scientific and medical conferences continue to favor English-proficient experts for keynote speeches.[8] Meanwhile the availability of translation services is often lacking due to the additional costs, logistical difficulty, or lack of planning.[8] The gravity of how much valuable learning is lost from this practice was deeply understood following the session on gender inclusivity on Day 1, which featured speaker and transgender activist Ms. Sophie Nouveau, a member of the State LGBT Health Technical Committee of Rio Grande do Sul in Brazil. This session was successfully organized because of the interconnected international network of the OC and GEIGS, which made translation available. Not surprisingly, the session was very well-received by participants and frequently mentioned in region-specific sessions. Removing linguistic barriers in academic spheres increases access to unique perspectives, which are otherwise missed when the discourse occurs in English only.[8]

Another session that proved challenging to organize, mainly due to the paucity of resources, was the one focusing on "Gender Equity and National Surgical, Obstetric, and Anesthesia Plans (NSOAPs)." Despite being a central concept in global surgery, to the authors' knowledge, no existing or openly available educational resources focusing on the integration of gender equity indicators and NSOAPs are accessible.[1]

Global Outreach and Social Media

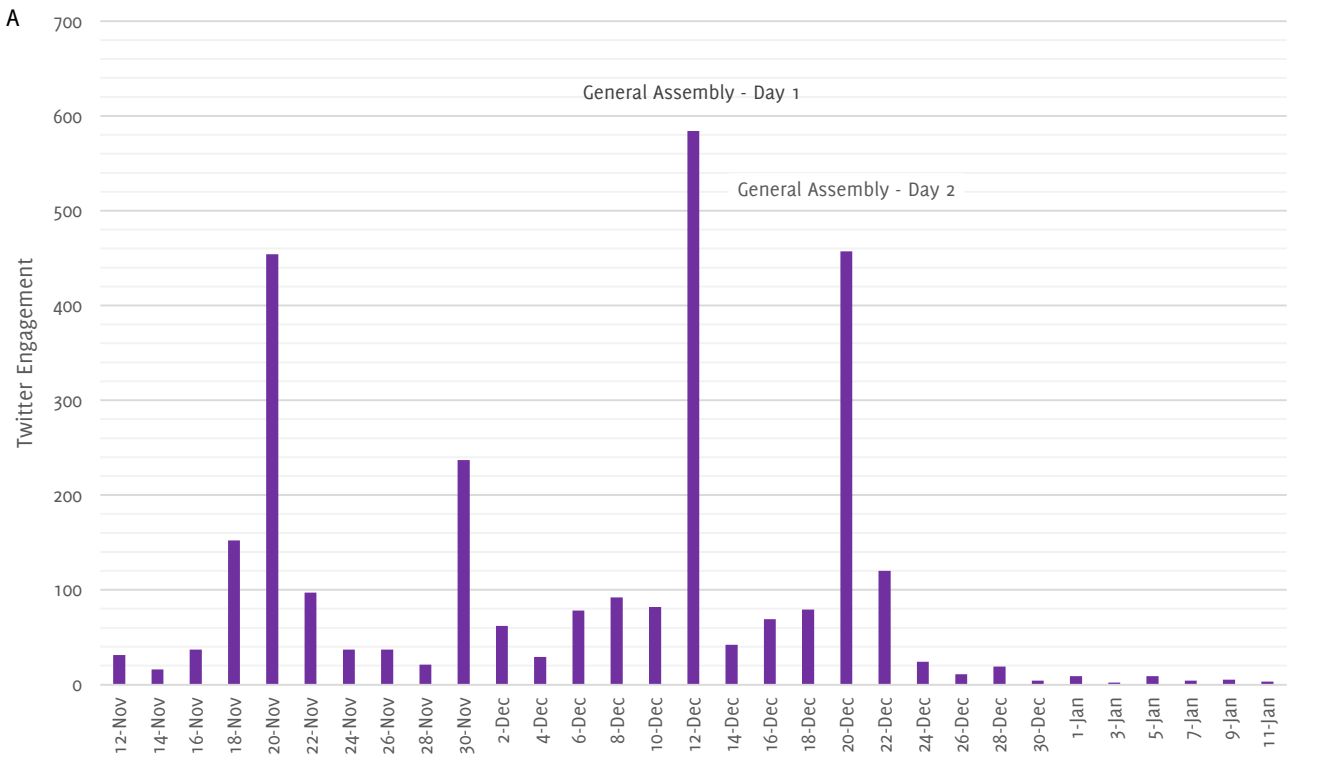
According to Twitter analytics from the GEIGS account, the General Assembly had 34 tweets but as many as 27,141 Twitter impressions (total number of views generated by original tweets and an indicator of brand presence) for the days that the event took place. While original tweets represent content creation from the OC, impressions reflect the influence of the tweets and interest from the general public in consuming this information.[6] GEIGS's Twitter impressions and engagement counts over a 60-day span that encompasses the General Assembly, as well as the days preceding and following the event, are depicted in ***Figure 2***. On Facebook, GEIGS saw a 394% increase in video engagement and a net 8% increase in followers following the live streaming of the event. With its opportunity for instantaneous global connectivity and discussions, social media can have an important role complementary to conferences in terms of enhancing scholarly dissemination, capacity building, and professional networking.[5]

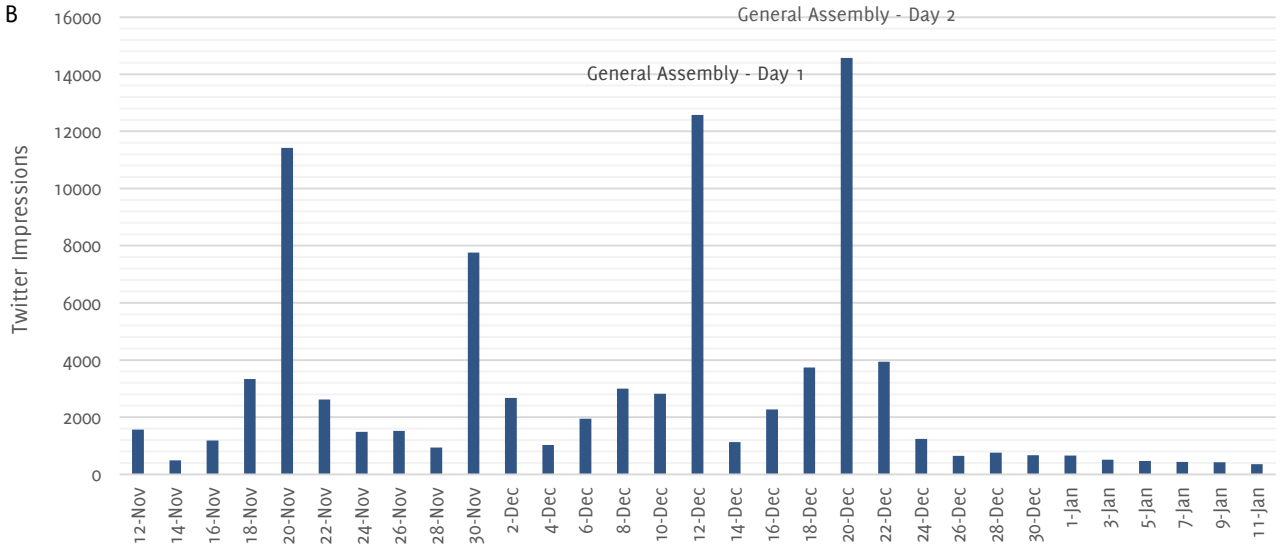
The "Intersectionality in Global Surgery" and the "The Value of Equity, Social Justice and Diversity in Surgical Education" sessions garnered the most attention and engagement on social media. Intersectionality is traditionally defined as the investigational framework of inequities exacerbated at the intersection of gender and race.[10] These sessions aimed to expand gender equity in SOA fields beyond the cis-normalized gender binary view and to highlight the additional inequities at intersection with these social identities, particularly in regards to racism.[10]

Conclusions

Engaging in global surgery demands management of actor power to promote visibility and attract stakeholders.[3] Consequently, identifying leaders who will build awareness and gather sociopolitical influence is critical. Hence initiatives like the GEIGS General Assembly are relevant to highlight the previously neglected topic of gender disparities in the global surgery field and to provide capacity building, education, supportive leadership, and diverse mentorship where these have been lacking. This conference model can be applied for other trainee-led global surgery conferences.

Figure 2: GEIGS Twitter (A) Engagement and (B) Impressions Before, During, and After the General Assembly.





Legend: The GEIGS General Assembly social media campaign launched its first promotional materials on November 30, with an invitation to save the date for the upcoming event. The campaign progressed in the following days with information on registration and external speakers, culminating in high levels of engagement (top) and impressions (bottom) on the days of the event.

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Compliance with ethical standards

All data collected from the participants were consented through the general assembly's registration form, in accordance with the European Data Protection Law GDPR. All registrants' information were anonymized for storage, and if they were free to request removal of their data in GEIGS storage. In addition, all presented data are aggregated in a manner to protect any possible identification of participants.

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Experience

Gender Bias and Stereotypes in Medicine: A Medical Student Experience

Sofia Jezzini-Martinez,[1] Daniela C. Gonzalez-Cruz.[1]

The Experience

Introduction

Gender bias is a universal phenomenon. Men are seen as the human default and the generic masculinity is embedded in human society.[1] It exists at home, at school, in the workplace, and its omnipresence originates consequences that have a lasting social and economic impact.[1-2] Up until the year 1903, no woman had ever won a Nobel Prize, and it was until 1990 that women in science –and specifically women in medicine– began to increase exponentially.[3-4] Despite these emerging scientific, social, and cultural changes, gender discrimination remains prevalent.

Student Experience

Since I entered medical school, I knew that I could run the risk of facing comments or situations in which being a woman was considered a disadvantage. Especially since one of the specialties that interested me the most was trauma surgery – a field that is well known for sexist behavior and gender discrimination. [5]

As I progressed, my interests changed, and the world of psychiatry became my passion and main area of interest. However, I never imagined what would happen a few years later.

In spring 2021, I began the fourth year of my career in a Mexican medical school with a six-year program. At the end of the semester, our assigned doctor asked the group some questions to get to know each other better and learn about our interests in the future. When he found out I was interested in becoming a psychiatrist, he explained that psychiatry is not a specialty for women. According to him, being in a consult and listening to a patient who is hysteric or depressed is emotionally exhausting, and for a woman, it would be very difficult to spend the whole day listening to patients complain and then go home to take care of her children. He also explained that at least in our institution, psychiatry is a department of men –since the majority of teachers and resident trainees are male. At that moment, I was shocked and struggled with how to react, so I only replied that psychiatry was still my main interest.

Living through that situation, I concluded that we could never cater to everyone's opinions, which reinforced my decision to follow my interests regardless of others' prejudices about my gender. However, several questions arose in my mind: What impact did this situation have among my colleagues and classmates – male and female– who were present? Had they identified the discrimination? What if his comment had been influential enough to cause me not to pursue my dream (or others') of becoming a psychiatrist?

After a few days, I discussed this situation with some of my female colleagues, and I was disappointed to discover that more than one had gone through similar situations. This led us to conclude the importance of eliminating gender stereotypes and opportunity biases within the medical area.

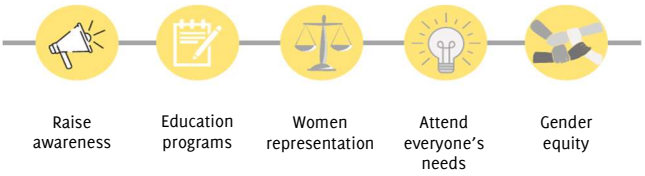
Possible Solutions

Raise awareness

Stone et al. (2020) write about distinguishing benevolent from hostile sexism. The latter is easier to identify since it consists of hostile behaviors based on gender, whereas the former is associated with elements such as patronizing women and gender stereotypes —women are seen as kinder, therefore, they should focus on "softer specialties".[5] We propose the inclusion of topics such as gender-based discrimination in the medical curriculum and to assess its impact not only on health workers but on the community, as well.

Another solution is to implement medical training that focuses on differences in presentation, diagnosis, and treatment of diseases between sexes to achieve better outcomes; especially since evidence has shown that significant differences do exist in the presentation and management of diseases such as myocardial infarction, Alzheimer's disease, and others. If our gender makes us so different, why are we teaching our doctors to diagnose and treat men and women the same?[6-7]

Figure 1. Possible Solutions to Address Gender Bias and Stereotypes in Medicine.



Education programs

Discrimination has also been reported by health care professionals of different minority groups such as the LGBT community and people of color who face social ostracization, discriminatory treatments, and workplace harassment.[8-10] Educational programs that involve *all* male and female medical students, faculty, and staff led by the institutions, which address gender bias, discrimination, and stereotypes in medicine and academia, need to be implemented. These programs should not only include testimonies and activities based on experiences to help students and physicians identify implicit gender bias and discrimination

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in real-life situations, but also evidence-based anti-sexist training to achieve the skills to remove systems that continue to perpetuate inequity .[11] Empathizing with the discrimination experiences could drive efforts to create respectful and fair workplaces for physicians.[2]

Attend the Needs of Everyone

Investigate what female students, resident trainees, and doctors need to have a more comfortable and advantageous experience within their institution – that is their medical school and hospital. Develop new policies and study their impact. Amir Ali (2015) studied the gender differences in the acquisition of surgical skills, proving that male and female medical students differ in their visuospatial abilities and gaming experience, but providing females with instructor feedback and training seems to eliminate these differences.[12] Another action that could help address everyone's needs is implementing childcare services in schools and hospitals to facilitate and promote healthy and inclusive parenting models among doctors.

Women Mentorship and Representation

In the recent Netflix documentary "Picture a Scientist", Dr. Raychelle Burks of American University in Washington, D.C., recalls that as a child, her female scientist role model was a fictional character. We need to increase female role models in teaching, mentorship, and research. Discrimination against women limits the representation of half of the population and their scientific advances avoiding the creation of more inclusive environments that could have implications for the care we provide to patients.[2]

Including more women in decision-making and policy-making positions promotes equity among representative and directive committees. A way to achieve equity in committees and departments is the implementation of policies that encourage setting a minimum limit on the number of females recruited each year to balance out the male: female ratio.

Conclusion

Today we are the ones who are behind the desk, but tomorrow we will be doctors, mentors, and researchers who will transmit knowledge and different perspectives to students, forging them as future specialists. It is important that *we,* as a society, educate ourselves in identifying stereotypes and gender-biased situations to eliminate gender discrimination in science. We need to understand that both male and female doctors are free to choose to practice the specialty they wish to without being questioned, criticized, and discouraged for wanting to stand out.

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Experience

A Medical Student's Volunteering Experience During the Second Nagorno-Karabakh War

Arturan Ibrahimli.[1]

The Experience

War is always a devastating situation for all the parties involved; no matter which one wins at the end, there is always something to lose, such as soldiers, money, and the nation's safety.

Due to the COVID-19 pandemic, we could not attend our university in Ankara, Turkey, between March 2020 and January 2021. Like many other universities in the world, classes in my university went fully online. I was confronted with the pandemic's difficulties, like the uncertainty of the period and the quality of distance learning.[1,2] I was in my home country (Azerbaijan, located in Caucasus region, in the coasts of Caspian Sea) and was attending online classes and having my routine study day. On the 27th of September 2020, we heard a war started between Armenia and Azerbaijan on the western side of Azerbaijan called the Nagorno-Karabakh region, a mountainous and forested region located in the south Caucasus.[3] It was a tremendous war with more than a hundred thousand military personnel attending on both sides.

The news from the war was not good for both sides; there were too many dead and injured soldiers each day. Hundreds of wounded soldiers were brought to nearby hospitals, and there was a need for extra medical personnel. I applied to several authorities as a volunteer to help the personnel for medical care to wounded soldiers; in the end, I was able to go to Salyan Central Hospital in Salyan (150km away from the war zone). In the meantime, while the media announced the news regarding the end of the conflict, the number of injured soldiers was increasing exponentially each day

Since the hospital where I was volunteering was not at the war zone, the soldiers were sent there from the field hospitals after the first aid was applied. I was assigned with a team of doctors to perform tasks given by the hospital administration. I was helping with the admission of soldiers to hospital rooms, primary surgical treatment like suturing, bandage change, and physical examination. I saw different types of injured soldiers; they mostly came with extremity wounds, trunk wounds, and concussions due to explosions. I was mainly affected by the soldiers who had concussions. They were in a strange condition; they could barely talk, comprehend, or walk. Most of them even did not know where they were and what happened exactly. I had an opportunity to talk with some of the soldiers, and their thoughts were touching; most of them wanted to go back to war and help their companions despite their injuries. While watching their medical conditions, I felt sorrow and despair as many of them would live with the psychological and physical effects of the war.

It was an exhausting period as COVID-19 was complicating the situation in hospitals, and no one knew when the war would end. The number of cases was increasing on a daily basis. So many of the doctors were in a fight with COVID, and some of them were infected and could not work. As a result, the help of medical students was necessary for hospitals. Moreover, the patient overload in hospitals increased the risk of infection spread.

Despite the fear of the pandemic, we were working day and night with our best. Ambulances were transporting the soldiers to nearby hospitals from the war zone, doctors were doing their best to treat the injured soldiers, hospital personnel was making every effort to help, and medical students like me were doing our best in every possible situation within the hospitals. I have experienced that in a war situation, the body's resistance increases against exhaustion.

The war took nearly two months and ended on the 10th of November 2020; it cost more than 6500 lives in total from both sides.[4,5] Nevertheless, I had an exceptional experience during that time. No matter how the war was an unfavorable event during the pandemic, I learned how to work under time and emotional pressure at the very early stages of my career as a physician. Moreover, working in a team to deliver the best care was another significant experience I have gained. Therefore, I can advise medical students that they should feel ready to help in emergency situations like a war in case of need, as your help may be more important than you thought.

In conclusion, the war period was surrounded by a great deal of emotions. Victorious or not, wounded and dead soldiers are a dark side of the war, which obviously influenced both nations. As many of the doctors were in a fight with COVID-19, in this doctor absence and patient overload, the helps of medical students were crucial during the war period. That experience of mine shows that medical students can also take a significant role in healthcare during a war. Volunteering in a hospital during a war was a strange experience and feeling that will last a lifetime on my memory.

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Experience

Health Education among Medical Students: A Challenge Worth Accepting

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The Experience

Nowadays, medical education mostly focuses on the diagnosis and treatment of disease, rather than disease prevention and health promotion.[1] In an effort to bridge this gap in our school's curriculum, our team has created a Health Education Program. According to the World Health Organization (WHO), "Health Education comprises consciously constructed opportunities for learning involving some form of communication designed to improve health literacy and developing life skills which are conducive to individual and community health".[2] Active student participation is a key component of this. Health Education activities can play a major role in assisting medical students to (I) understand key factors and strategies for prevention, (II) promote individual and societal health, and (III) understand the impact of social determinants of health (e.g. culture, religion, etc.) on health behavior and health.[1] Such competencies are deemed necessary by both regulating bodies and medical students themselves.[3,4]

Our Team

The Aristotle University of Thessaloniki (AUTh) School of Medicine Health Education Team has a long-standing presence in our university. Its main goal is to engage medical students in ideals of Health Education. Our Team consists of experts on Health Education (doctors, dieticians, physical education teachers, psychologists, public health workers) and, of course, medical students. See ***Figure 1***. These medical students are trained on Health Education and on basic soft skills by the team of experts mentioned above. Both sides cooperate during the year, in order to assess the needs of medical students, and create a suitable Health Education Program.

Figure 1. AUTh School of Medicine Health Education Team.

The Program

The Program takes place every year, from March until June. Preparations start in November with experts and student coordinators working together on weekly basis. The Program starts in March with a seminar which is open for all medical students, and acts both as an introduction to the role of Health Education, as well as an open invitation to join our Team and participate in the upcoming workshops of our Program. The workshops are designed to cover a number of different subjects including:

- Social role and personal identity
- Addiction in our life: Addiction and behavioral change
- Sex: Pleasure, risks, and safe choices
- Healthy eating and exercising: How do they affect our physical and mental health?
- How to design a Health Education program: Steps, tips and action

Each workshop is carried out by an expert in cooperation with two medical students, who are properly trained on the workshop topic during the preparation period. Each workshop consists of two parts. The introductory part is more theoretical and is presented by the expert. The other part is coordinated by the students and is focused on team building activities, as well as activities that help students exchange opinions and ideas on the topic of the workshop. Methods used during the workshops are shown in ***Table 1.***

Table 1. Methods Used During the Workshops.

Methods
Brief lectures
Role playing
Drama
Simulation exercises (e.g. creating an intervention for a given problem)
Discussion and reflection on activities (in small working groups, and as a whole group)

Last year, 25 students participated in the open seminar and 18 students enrolled for the workshops, 13 of whom successfully completed the Program.

Medical Students as Coordinators

The idea of peers being involved in our Team was discussed in our group after realizing that it constitutes a valuable tool in training students around the world in a range of health topics.[5] Student

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coordinators had previously attended a circle of Health Education workshops and were invited to join the Team during the beginning of the preparation period.

During the preparation period, medical students were able to interact and cooperate with people who have been actively working on Health Education for years. They had the opportunity to experience first-hand the procedure of designing such a program as well as work in an interprofessional group. Additionally, they were encouraged to delve into research on the topics of the workshops, and were regarded as equal team members, as they participated actively in the process of workshop design.

During the workshops, medical students were able to experience the role of the coordinator. It was perceived as quite a challenge to stand in a room full of colleagues and interact with them whilst needing to assess group dynamics and the engagement of participants. Presentation skills and group management were two main skills that were practiced during the workshops. Furthermore, sharing feedback after every workshop proved to be vital, since it gave medical students the chance to reconsider their approach and possible mistakes. At the end of the Program, feelings of satisfaction and gratitude were shared among the Team. After spending seven months working together, we were not just a team, but a family working for a unique purpose.

Positive Outcomes and Obstacles

To help others who might be interested in developing a Health Education Program like ours, we would like to share some advice based on our personal experience.

On the positive side, students understood the importance of Health Education and the role that doctors can have in this effort. Furthermore, medical student involvement as workshop coordinators, which was positively evaluated by the participants, provides the opportunity to expand our Team by including more students, after training them on developing some essential skills regarding Health Education. It is also a motivation for students who completed the Program to continue their involvement in the Health Education Team, as some of our participants did.

However, on the other hand, the gradual decrease in the number of participants is a great threat to this kind of elective program. This must be taken into serious consideration while designing the program since its duration, the number of workshops, and the holidays intervening can affect the number of participants. Furthermore, materials and methods used should be diverse and captivating rather than simply consisting of theoretical lectures. Another pitfall is including too many subjects, since covering all of them in appropriate length and detail will either be impossible and end up in poor educational results or cause the extension of the duration of the program which will probably result in some participants quitting.

Promoting the program among medical students is also an important factor that can affect participation. This is why investing time and effort on preparing good promotional material is crucial. Needless to say, one should use all available promotion means (including social media and printed materials).

The Big Picture

This Program is part of our ongoing initiative "Healthy People, Healthy University" that aims at creating a healthier campus by helping students and university staff in making healthy lifestyle choices. For our vision, our Team received an award from our university in July 2019. "Healthy People, Healthy University" was chosen, after an open call for ideas (under the name "ImproveMyCampus") that were envisioned to improve our campus, as one of the best proposals.[6]

We were planning to expand our Program to include students of other specific faculties (Departments of Psychology, Education and Physical Education and Sports Science) along with medical students. Graduates of these faculties can have a decisive role in Health Education. Unfortunately, the SARS-CoV-2 pandemic has resulted in the suspension of all in-person academic activities. Nevertheless, it has emphasized the importance of Health Education.[7]

Limitations

Despite collecting evaluations from both participants and student coordinators which followed after the program, due to the small number of participants, we decided not to conduct any analyses. Such analyses would not lead to firm conclusions that could be easily generalized. Therefore, it should be made clear that we herein just convey our experience. Further cohorts including larger numbers of participants may allow for a more objective, evidence-based, conclusion, regarding this type of Health Education Program.

Conclusion

In conclusion, including students as coordinators was positively perceived by all involved parties (experts, coordinators, and participants). Despite difficulties which such a program might face, overall the program has potential to promote Health Education. At the same time, such a program can function as a recruitment tool for the team, acting as a nucleus for further future initiatives. From the perspective of medical student coordinators, this was a remarkable experience which combined practical and theoretical engagement in Health Education and presented a great opportunity to step out of their comfort zone and create something new, all the way from conceptualization to implementation.

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