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Cross-Sectional Study: Assessment of Health and Digital Literacy among First-Generation Muslim Immigrant Women in Atlanta City during the Pandemic

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Abstract

Study Aim: Assess health and digital literacy, and to evaluate telehealth awareness after COVID-19 of the first-generation Muslim women in Atlanta. **Methods:** Multi-approach design. *Phase I:* We assessed health and digital literacy of 42 participants. *Phase II:* We measured Knowledge, Attitude, and Practice (KAP) of using Telehealth by surveying 45 participated women. We assessed how COVID-19 affected the participants' KAP to use telehealth services. **Results and Discussion:** *Phase I:*Strong correlation between the recognition and the comprehensive parts of health literacy test (r=0.80). Education and existence of chronic disease strongly affected test scores in the comprehensive and recognition test parts (r=0.6; 0.86; p<0.05). All respondents used computerized devices daily for general purposes. 33% of participants had usability, social, language, or accessibility barriers in using their devices. *Phase II:* 55% of participants had previous Knowledge of Telehealth, telemedicine, or other forms of virtual medicine. 81.1% would not consider using Telehealth services before the pandemic. 60% agreed that COVID-19 increased their willingness to try Telehealth in the future.

Key words: Health Literacy, Digital Literacy, First-Generation Immigrant, Women, COVID-19

Graphical Abstract

Background: There are concerns regarding first-generation Muslim Immigrant women's health and computer literacy, understanding of American health systems, and proper use of existing healthcare technology and services.

Aims: Assess the health and digital literacy of the first-generation Muslim women in Atlanta city. Assess health information technology awareness after COVID-19 among targeted women.

Methods: Multi-approach study design. **Phase I**: Using validated and replicated measurements, investigators assessed the health and digital literacy of 42 first-generation immigrant Muslim women. **Phase II:** Using an innovative questionnaire, investigators measured the Knowledge, Attitude, and Practice (KAP) of using Telehealth surveying 45 first-generation Muslim immigrant women in Atlanta. They also assessed how COVID-19 has affected the participants' KAP to use telehealth services.

Results: Phase I: *SAHL Literacy test*: Forty-two participants, test score (Mean=16; SD; 0.77). There was a strong correlation between the recognition and the comprehensive parts of SAHL literacy test (r=0.80). Education and the existence of chronic disease strongly affected test scores in the comprehensive and recognition test parts (r=0.6; 0.86; p<0.05). *Digital Literacy Test*: All respondents used computerized devices daily for general purposes. 33% of participants

had barriers in using their devices: slow and inconsistent internet connection, inappropriate devices' usability and understanding, limited English language proficiency in understanding and finishing moderate to advanced computerized life and health-related tasks, preference for paper-based work over device-based tasks, and unconfident in using the devices effectively. **Phase II**: 55% of participants had previous Knowledge of Telehealth, telemedicine, or other forms of virtual medicine. 81.1% would not consider using Telehealth, telemedicine, or virtual medicine services before the COVID-19 pandemic. 60% agreed that COVID-19 increased their willingness to try Telehealth in the future.

Conclusion: A cultural-linguistic health-related website or application can help immigrants' in locating, accessing, and using available healthcare resources. COVID-19 increases the awareness about telehealth services in immigrant communities.

Highlights

- The current study is the first pilot study on Muslim Immigrant women's health and digital literacy in Georgia State. The study revealed that highly educated women had better health and digital literacy scores. Participated women who have, or family members, previous chronic diseases were more health literate than other women who did not have regular communication with health care providers and continuous exposure to the American health system personnel and services.
- Communities' leaders and public health professionals can organize customized cultural and linguistic health educational interventions to elevate awareness and knowledge among Muslim immigrant women. The interventions can be conducted via community campaigns and seminars targeting critical individual and public health issues and diseases.
- The pandemic increased the awareness of the importance of telehealth and virtual medicine services among the participating women. However, the highest awareness was among first-generation participating women, who have had prior knowledge and education about health information technologies. More health campaigns about the importance of accepting and adopting different health information technology tools and strategies can be done to increase further the knowledge, attitude, and practice (KAP) among disadvantaged, first-generation immigrant women.
- The current study produced preliminary results to supplement an NIH grant application to leverage health information technology to reduce the health inequalities and disparities amongst disadvantaged and underserved first-generation Muslim immigrant women.

Introduction

There is a substantial Muslim migration movement to North America and Europe for several reasons, mostly refuge from war areas and partly to search for better work and educational chances. This enormous movements of Muslim countries make confident that those immigrants will be encountered as clients to be served by the healthcare systems of the countries that those immigrants choose to live in.[1,2]

The United States Census Bureau (USCB) defined the first generation of immigrants as "composed of individuals who are foreign-born, which includes naturalized citizens, lawful permanent residents, protracted temporary residents (such as long-staying foreign students and migrant workers, but not tourists and family visitors), humanitarian migrants (such as refugees and asylees), and even unauthorized migrants".[3] Beliefs and cultural norms have been essential in health and related health behaviors and practices among first-generation Muslim immigrants.[2] Customizing health-related interventions to improve cultural aptitude could improve the targeted cultural groups' health outcomes.[4] A study in Canada showed after the researchers controlled the confounding factors, that the immigrants had lower health literacy scores than the non-immigrants. The same study revealed that their low language proficiency was essential in determining their functional health literacy skills and capabilities.[5]

There are always concerns regarding first-Generation Immigrant women's health and computer literacy, an adequate understanding of the health systems, and the use of the existing healthcare services effectively and efficiently. There are several barriers could affect their health provisions, Knowledge, behavior, and attitudes, such as the language proficiency level, preference for cultural and traditional remedies, socioeconomic factors, fear of stereotyping, limited accessibility to health services, and general unfamiliarity with the existing health services and resources.[6-9]

The current literature proved that immigrant women were less likely to screen for different types of preventable cancers like breast and cervical cancer, and the women who lived longer than ten years in an immigration country showed compared screening test rates as the non-immigrant women. The compliance is also determined by other accompanying variables like higher education, socioeconomic level, young age groups, and marital status.[10]

Telehealth includes telemedicine, an information technology used to conduct audio/video calls to the patient by a healthcare provider to deliver diagnosis and treatment services for patients. Telehealth made it possible to ensure that the demands and needs of the patients were being met while maintaining safe social and physical distancing.[11] Telehealth has been beneficial all across the U.S. during the COVID-19 pandemic, and the tactics used to provide healthcare assistance to patients have changed because of the fear of the spread of the infection while ensuring that safety measures and protocols were followed to prevent the spread of the virus. Access to health information technologies suchastele health is an excellent tool because it tack les the issue of not having access to high-quality health services for individuals living in low socioeconomic areas.[12] If minorities have access to telehealth and enough awareness regarding this health information technology, minority groups won't have the issue of traveling long distances to have access to healthcare needs.[13] Having telehealth services using language so therthan English will allow First-generation immigrants to be much more open to telemedicine.

An article states that telehealth has made technologies like telemedicine, tele-education, tele-practice, tele-research, and teleconsultation possible using video streaming and live interactive A.V. links.[14] A new modular telemedicine platform, In telehealth, which uses an Android-based and cloud-based platform, will be established with electronic health record (EHR) systems at hospitals and healthcare facilities.[7] This software has been designed to operate on an internet connection that does not have a robust bandwidth, so it is appropriate to work in the rural parts of the country.[7]

The current study aims to assess the health and digital literacy of first-generation Muslim women in Atlanta city; examine how the COVID-19 pandemic has encouraged the use of health information technology such as telehealth, and analyze how awareness regarding telehealth plays a role in terms of KAP for first-generation Muslim women immigrants in Atlanta. The investigators used different unique research tools over two phases to examine the study's aims and to test the study hypotheses.

Materials and Methods

The current study is a pilot cross-sectional descriptive research that evaluated the data at a specific time. The study produced preliminary results to supplement an NIH grant application to leverage health information technology to reduce the health inequalities and disparities amongst disadvantaged and underserved populations. The investigators collected the study data in two phases using different tools. Phase one was conducted in June 2022, and the investigators used instruments to measure health and digital literacy amongst 42 first-generation immigrant Muslim women. Phase two was conducted in November 2022, and the investigators measured the KAP of using health information technology such as telehealth from a sample of 45 first-generation Muslim immigrant women in Atlanta, in addition, the investigators measured how the current pandemic has affected the studied group's KAP to use telemedicine and telehealth services.

Both phases' study participants were recruited using convenience sampling methodology. The investigators collected 18 or older first-generation Muslim immigrant women for both study phases. The study excluded Immigrants who hold work visas and second-generation immigrants. Mercer University's IRB approved the study proposal. The participants were asked to sign an informed consent before answering the study questionnaires.

Phase I Data Collection

In phase I, the data was collected in person from the respondents at Bono-Bono Cafe in Atlanta. Three trained undergraduate research assistant students collected the data using two standard and extensively studied health and digital literacy assessment tools.

Health Literacy Questionnaire

Short Assessment of Health Literacy (SAHL). The SAHL is a non-proprietary measure developed by the Department of Health and Human Services Agency for Healthcare Research and Quality (AHRQ). This brief measure includes 18 items, which consist of sets of three words printed on 4 x 5 inches laminated cards. The three words have a medical term, an associated term, and a distracter term. The user manual includes scripted instructions to ensure the administration is standardized, eliminating potential bias during instruction. The participant is shown the three words and then, after reading them, are asked to say which of the two words is more similar to or has a closer association with the first word, letting them know they can say "I don't know" if they are not sure and asking them not to guess. All points are totaled, and a score of 0 to 14 suggests low health literacy.[15]

Digital Literacy Questionnaire

The study investigators used the computer literacy questionnaire built for an Australian study in 2016.[16] The survey included three sections. The first part consists of questions about the current computer use and the functionalities that the participants use the computer for, and how frequently they use these functionalities. The second part have more detailed questions about the type of devices they are using, if they need assistance when using these devices, assess their attitude about using these devices for everyday purposes, determine if they are using these devices for health-related tasks, and their perspective on using these devices for health-related tasks. The third part measures the respondents' confidence in using computer devices for general purposes and health-related tasks. The results of the survey will be divided into Low Level and Sufficient Levels of computer literacy.

Phase II Data Collection

The data was collected by asking questions through an online survey link using Google Forms. The participants were female Muslim women selected using convenience sampling at Faizane Madina Islamic Center Atlanta. Google Forms was used, where the responses of the participants were analyzed within the built-in statistical package of Google Forms. The investigators constructed an online survey that best fit. They described the effect of the COVID-19 pandemic on the use of health information technology, such as telehealth, among first-generation Muslim immigrant women in Atlanta. The survey audience was first- generation Muslim immigrant women in Atlanta, and all their responses were recorded while maintaining their confidentiality and security. The survey consists of 22 questions. The first eight questions of the study were basic demographic questions that talked about the participants' age, marital status, citizenship status, education level, family household size, education level, and the number of years they have been residing in Atlanta. After that, the next set of questions focused on getting participants' information regarding their exposure to telehealth and virtual healthcare services during the COVID-19 pandemic. Then the last set of questions focused on virtual medicine services before the COVID-19 pandemic and the willingness to use future telehealth services.

Theory

The current study hypotheses were 1) the first-generation Muslim women have had low health and digital literacy scores

due to social and cultural barriers; 2) the COVID-19 pandemic has encouraged the use of health information technology such as telehealth for first-generation Muslim immigrant women in Atlanta in terms of Knowledge, Attitude, and Practice (KAP).

Results

Phase I Results

SAHL Health Literacy Test

All the participants took an average of around 8.5 minutes to finish the SAHL literacy test. The SAHL scores' frequency and distribution are shown in Tables (1 and 2). Most of the participants, 27 (65%), successfully passed the recognition task, where the respondents successfully pronounced all the test items. SAHL test's comprehensive task, where the respondents were able to recognize the keyword for each tested item. SAHL's comprehensive task results were comparable to the recognition test's results. Cronbach's alpha for the recognition and comprehension tests were 0.86 and 0.85, respectively. The Pearson test showed a significantly strong correlation between the recognition and the comprehensive parts of the SAHL literacy test (r=0.80). The educational level and the existence of chronic disease variables strongly affected the correct scores for the candidates in both tests' results with an (r=0.6; 0.86) $p<0.05$ for both variables.

The participants' age was ranged between 18-62 Years Old. Twenty-seven (64%) participants were from the age group (34-45 years old). Twenty-five (60%) of the participants held a bachelor's degree or higher, 13 (30%) had associate degrees or lower, and 4 (10%) held a master's or doctorate. Thirty-seven (88%) of the respondents were married, 3 (7%) were single or separated, and 2 (5%) was a widow.

Table 1. Descriptive Statistics of Short Assessment of Health Literacy (SAHL) Scores.

Score 1-18	Frequency	Percentages
10	3	7%
14	8	19%
16	5	11%
17	16	39%
18	10	24%

Table 2: Mean and Standard Deviation of Short Assessment of Health Literacy (SAHL) (N=42).

Variables	Number	Minimum	Maximum	Mean	Standard Deviation
The Respondents' scores	42	10	18	16	0.77

Table (3) shows the correlations between the education level, age, and existing chronic disease variables and the SAHL score. At the alpha of 0.05, there was a correlation between the respondents' test score, educational levels, and the existing chronic disease variables ($p<0.05$). No correlation existed between the respondents' age and test scores ($p>0.05$). The investigators used a multiple linear regression test, and they found that the SAHL score was statistically significant with the respondents' education level and the existence of chronic disease variables. The SAHL score was not statistically significant with the respondents' age variable.

Table 3. Correlations Between Age, Educational level, and Existence of a Chronic Disease Variables. SAHL Score of Examinees (N=42).

Variable	The Statistic	Education	Age	Chronic Disease
SAHL Score	*r*	0.60	0.14	0.86
	p	0.02	0.07	0.001

Digital Literacy Test

All the respondents have used computerized devices daily for different general purposes. All the respondents (100%) have used computer desktops, laptops, tablets (android or Apple devices), and smart phones for various digital daily tasks. Four respondents (10%) needed help using the computerized devices, mostly in getting into programs and correctly

following the requested tasks per program or functionality.

Twenty-eight respondents (67%) do not have barriers to using computerized devices, while a third of participants (33%) have experienced some barriers. The respondents' barrier list was: slow and inconsistent internet connection, inappropriate devices' usability and understanding, limited English language proficiency in understanding and finishing moderate to advanced computerized life and health-related tasks, preference for paper-based work over device-based tasks, and unconfident in using the devices effectively. When we asked the respondents what would help them to use a computer, the respondents' answers list was: speedy and continuous internet, good interfacing and friendly-used devices, getting trained or supervised while they were doing complex computerized tasks, high-level English proficiency, the simple and understandable language of the functions and forms.

The percentages of the daily general purposes that the respondents have used the computer devices for are listed in Table (4). All participants (100%) use computerized devices for Email, social media, chatting, and calling apps and explore Google or other search engines for web surfing purposes. Forty participants (95%) use the devices for writing letters, forms, banking, and entertainment. Thirty-eight respondents (90%) use computerized devices and apps for shopping. Thirty-two (76%) of the respondents use computers for health-related purposes for themselves and relatives. Eighteen (43%) use computerized devices and apps for household and business budget planning and filling.

Table 4. The Daily General Purposes of Using Computerized Devices by the Respondents

Computerized Task	Number of Respondents per Purpose (n)	Percentages of the Respondents per Purpose (n/Total Respondents)
Writing Letters	40	95%
Household Budget/Filing	18	43%
Banking	40	95%
Email	42	100%
Social Media (Facebook, Twitter, etc)	42	100%
Messenger and Calling Apps	42	100%
General Interest/ Web Surfing	42	100%
Shopping (Groceries, Clothes, eBooks, Music)	38	90%
Entertainment (T.V., Movies, Bookings)	40	95%
Health-Related Services	32	76%

The list of the health-related purposes amongst the respondents was: upload and use patient portals from home or libraries to communicate with providers; use links and fill in forms during a therapy session with a therapist or a nurse: fill in health-related application, schedule or cancel doctor appointments, communicate with their health insurance agents regarding paying bills and check their coverage for health services; uploading mobile health application for family planning and period tracking, calories intake, physical activity apps.

When we asked the respondents to rate their confidence using a computer or related technology for daily general purposes: 2 (5%) were unconfident, 12 (28%) were uncertain, and 28 (67%) were confident—figure (1).

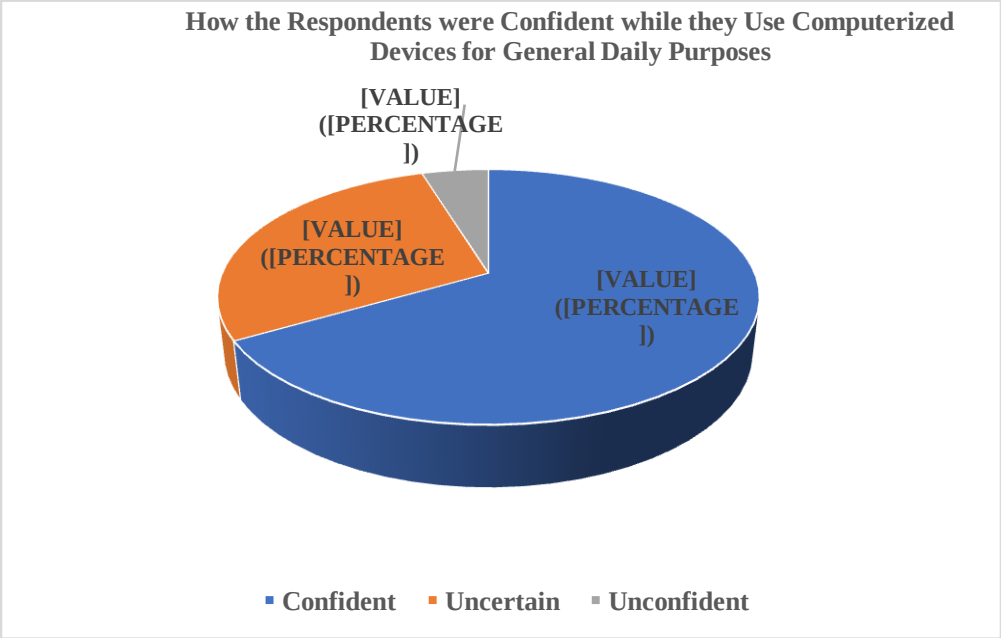

Figure 1. The Respondents' Confidence while They Use Computerized Devices for General Daily Purposes.

Phase II Results

A total of 45 participants took part in the survey using Google Forms. Table (6) demonstrates the participants' demographic data, and Table (7) shows the results of analyzing the data collected regarding telehealth and virtual healthcare services during the COVID-19 pandemic.

Table (5) shows that twenty (44.4%) participants were 40 - 60 years old. Thirty-nine (86.7%) of the participants were married women, with 31 (68.9%) being citizens and 15 (31.1%) being permanent residents. Nineteen (42.2%) of the participants held graduate degrees, 11 (24.4%) held undergraduate degrees, and 15 (33.3%) held high school diplomas or less. Twenty (44.4%) have resided in Atlanta for more than ten years, 13 (28.9%) of the participants have lived in Atlanta for 5-10 years, and 12 (26.7%) of the participants have resided in Atlanta for 1- 5 years. Twenty-five (55.6%) participants were unemployed, and 20 (44.4%) were employed. Twenty-nine (65.5%) participants held private insurance, whereas 16 (20%) had governmental insurance. Twenty-seven (59.1%) of the participants live in 3-6 members families, 10 (22.7%) live in families of 1-3 people, and 8 (18.2%) live in a family of 6 members or more.

Table 5. Phase II Participants' Demographic Distribution

Demographics Character	Frequency	Percentages (%)
Age Group:		
• 18-24 years old	10	22.2%
• 25-39 years old	15	33.3%
• 40-60 years old	20	44.4%
Marital Status:		
• Married	39	86.7%
• Not Married	6	13.3%
Citizenship Status:		
• Citizen	31	68.9%
• Permanent Resident	14	31.1%
Education Level:		
• High School Diploma	15	33.3%
• Undergraduate College level degree	11	24.4%
• Graduate Degree	19	42.2%

Number of Years Residing in Atlanta, GA, USA		
• 1-5 Years	12	26.7%
• 5-10 Years	13	28.9%
• >10 Years	20	44.4%
Employment Status:		
• Unemployed	25	55.6%
• Employed	20	44.4%
Type of Health Insurance:		
• Private	29	65.5%
• Governmental Insurance (Medicaid)	16	20%
Household Family Members:		
• 2-3 People	10	22.7%
• 3-6 People	27	59.1%
• >6 People	8	18.2%

Table (6) demonstrates the survey questions that assess the participants' Knowledge, attitude, and practice regarding telehealth and virtual healthcare services. Twenty-five (55 %) participants had previous Knowledge of telehealth, telemedicine, or other forms of virtual medicine. Thirty-six (81.1%) of the participants would not consider using telehealth, telemedicine, or virtual medicine services before the COVID-19 pandemic. Only nine (18.9%) would do. Twenty-seven (60%) participants admitted that COVID-19 increased their willingness to try telehealth in the future. When we asked if the participants would plan and consider scheduling telehealth services in the future, 23 (52%) of the participants answered "Yes ."The most common reason amongst the participants who will consider telehealth services was because they will be more affordable than personal visits, Convenient, and there is no need to take a day off or travel; they will not be exposed to the virus and infected people. The participants do not want to consider telehealth services in the future because telehealth is only for minor illnesses and primary care follow-ups; virtual services have low quality and continuous care concerns; doctors should perform exams in person to give the correct diagnosis and treatment to patients.

Table 6. Knowledge, Attitude, and Practice (KAP) Regarding Telehealth and Virtual Healthcare Services during COVID-19 Pandemic.

Variables	Frequency (n)	Percentages (%)
Knowledge Regarding Telehealth, Telemedicine, or Virtual Medicine Entails		
• Yes	25	55%
• No	20	45%
Consider Using Telehealth, Telemedicine, or Virtual Medicine Services Before the COVID-19 Pandemic		
• Yes	9	18.9%
• No	36	81.1%
Are You Planning or Considering Scheduling Telehealth services in the future?		
• Yes	23	52%
• No	22	48%
Has COVID-19 Increased Your Willingness to Try Telehealth in the Future?		
• Yes	27	60%
• No	18	40%

Figure (2) shows the participants' responses when we asked them to compare telehealth or virtual services to in-person services. Telehealth is an excellent option to start a consultation, followed by in-person visits. Telehealth and virtual services are comparable to the in-person services.

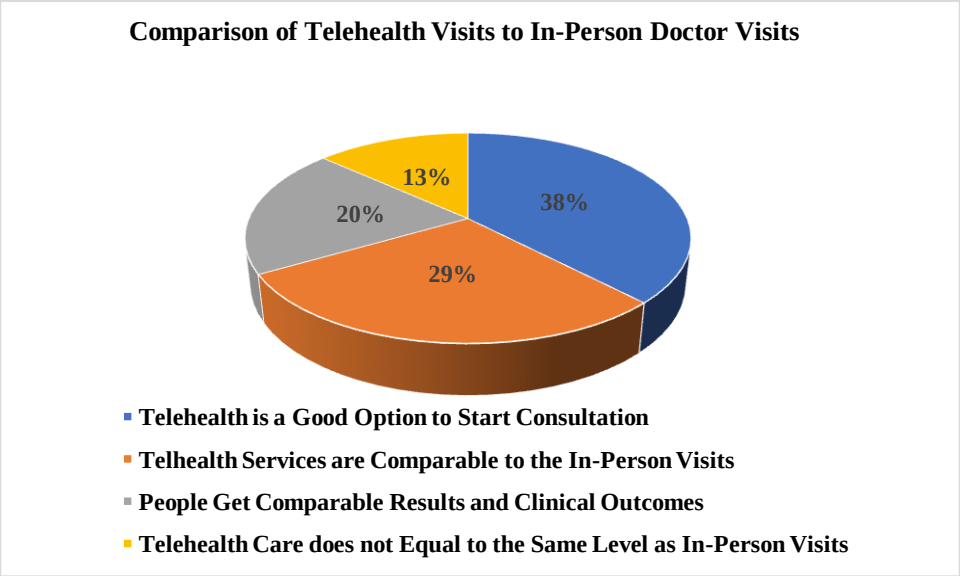

Figure 2. Respondents' Comparison of Telehealth Services to the In-Person Visits.

The KAP of health information technology, such as telehealth, was investigated based on the responses of 45 respondents. The results were divided into two tables (Tables 5 and 6). Most respondents were 40 - 60 years old Muslim women, married, well-educated, unemployed, and residing in Atlanta for more than ten years.

The majority of the participants held private insurance, and their household family size number was three to six people meaning that these women either had children or were residing with multiple individuals in their household.

At the time of the current study, about half of the participants had adequate Knowledge about telehealth and virtual medicine. But most respondents did not consider using telehealth, telemedicine, or virtual medicine services before the COVID-19 pandemic. The Knowledge about the importance and value of telehealth and virtual medicine visits has been recently added after the pandemic when healthcare providers recommended social distancing and virtual medicine.

As the awareness regarding telehealth increased, KAP about health information technology, such as telehealth, was raised among the first-generation women in Atlanta. However, as the attitude, practice, and Knowledge of health information technology decreased, telehealth usage also reduced among the first-generation women in Atlanta. Half of the study sample will consider scheduling telehealth services in the future.

Discussion

The SAHL Health Literacy test scores were approximately normally distributed with an average score of 16 out of a scale of 18, and this is a good indication but may be due to the small sample size and the sampling technique that we used for the current study. This study was the first study conducted on Muslim Immigrant women's health literacy and as pilot research to get preliminary results to support an NIH grant application. We would recommend that larger random samples of immigrant Muslim women should be studied in the future to get more accurate results. Most participants (63%) got scores of 17 or 18 out of a scale of 18. These high scores correlated to the education level and familiarity with the U.S. health system due to one or more chronic diseases in the family. A study published in 2020 revealed that health literacy capacities are associated with familiarity with chronic diseases and exposure to health system tasks consistently.[17] Health literacy levels depend on different critical thinking, communicating, responding, and interacting capabilities among individuals.[17] The literature pointed out that health literacy was higher among chronically-ill young individuals who held postsecondary or higher educational levels.[17,18] The current

high health literacy scores amongst the chronically -ill participants might be because they were well-informed by their providers and due to their familiarity with their illnesses and frequent exposure to the American health system.

A study revealed that high health literacy scores correlate with high education levels of Muslim women.[19] Low-grade English reading levels were associated with low functional health literacy capabilities and high average annual healthcare costs.[20] A study indicated that English proficiency was the first predictor of the immigrants' health literacy. The same study recommended several linguistic methods to correctly measure health literacy in bilingual communities.[21] An investigation revealed that Immigrants' Maternal education was a substantial factor that predicts immigrant women and family health literacy.[5] So, women's English proficiency and educational levels are critical variables in predicting functional health literacy for the women and their family members. The current study investigators recommend innovational bilingual interventions targeting first-generation women to help them understand health-related information and access different healthcare resources effectively and efficiently. The present literature found that health literacy scales could assess the presence of Knowledge about serious health topics and diseases but will not accurately predict the knowledge and practice levels about the illnesses. The immigrants could know the disease but need help understanding and accessing the preventive and screening interventions. Another study revealed that religious values and norms strongly impact Muslim immigrant women's health behavior and practice. Health providers and general and private health agencies should offer approaches to enhance functional health literacy amongst this group.[22] All health-related interventions must be customized according to the immigrants' culture and religious rules to be adopted and accepted by the immigrants.[23-25]

Digital literacy, or “the sufficient ability or comfort with technology," is the main barrier most disadvantaged community groups, including English-limited immigrants, to realize the importance of mastering essential technology skills in enhancing health and life quality.[26] All respondents used different types of computerized devices for various digital daily tasks. Emailing, social media, chatting and calling applications, and surfing the web were the most daily digital activities of the participants. More than two-thirds of the respondent women have used computerized devices for health-related purposes for themselves and relatives, and two-thirds of the respondents were confident in using technology to conduct their general digital activities. This high percentage may be because the study sample was small, and most participants were middle-aged women with bachelor's degrees or higher. Also, most of our respondents were married women and mothers, so they must have experience using different computerized devices as mothers and new language learners to earn digital biliteracy skills and Knowledge.[27]

We recommend that future scholars have a more comprehensive sample that includes similar percentages of all educational levels and ages. One-third of the respondents said they need help finishing some complicated daily digital activities. A study proves that the immigrant's technology use is determined mainly by desires and profits rather than awareness of its importance in improving their well-being and life quality.[28] Targeted strategies should be conducted to educate disadvantaged groups on the significance of mastering essential technology skills to complete daily digital duties for better health and life quality.

The respondents' purposes for using computerized devices to conduct health-related duties were: to upload and use patient portals from home or libraries to communicate with providers; use links and fill in forms during therapy sessions with a therapist or a nurse: fill in a health-related application, schedule or cancel doctor appointments, communicate with their health insurance agents regarding paying bills and check their coverage for health services; uploading mobile health application for family planning and period

tracking, calories intake, physical activity apps. All these indicate the degree of the respondents' engagement in the healthcare provision process, show the interaction and communication with the providers, and point out how they actively decide for themselves and their families.

Current literature pointed out that immigrants found virtual medicine visits desirable because they have enough time with their providers and save them from office visits related to requirements for English as second language speakers.[29] To reduce health inequalities, the investigators recommended tailoring cultural and linguistic interventions and education material for the immigrants in both office and virtual visits. The same literature pointed out that leveraging telehealth and other computerized platforms will reduce health disparities and digital divine among immigrants and other disadvantaged groups.[30]

The current study shows a strong correlation between the KAP of first-generation Muslim immigrant women regarding telehealth services and awareness of virtual healthcare services during the COVID-19 pandemic. The first-generation participating women with prior Knowledge and education about health information technologies were likelier to practice telehealth. They had a more positive attitude than first-generation women who did not know as much about health information technologies. The pandemic has caused more awareness of health information technologies and aided in accepting the use of these technologies by the first-generation Muslim immigrant women of Atlanta. The current literature proved that before the pandemic, there was not much awareness regarding telehealth services, but after the pandemic, much more awareness was spread.[31,32] Awareness regarding telehealth services should continue to be raised as it allows more positive KAP for accepting these technologies by first-generation Muslim women immigrants in Atlanta. A study showed that a bilingual facilitator was essential for high-quality and effective telehealth visits for old bilingual patients with limited English proficiency and digital literacy.[33] The literature recommends that future research should design and innovate custom-made telehealth and virtual medicine services that consider cultural concerns, language proficiency, and digital literacy for the patients to be accepted and attain the required outcomes of these services.[34]

Conclusion

This study is the first on Muslim Immigrant women's health literacy in Georgia State. Due to the current study's sample size and sampling technique, we recommend conducting a similar methodology to include a more significant randomly selected sample, including more illiterate and elderly immigrant women. Highly educated immigrant women had high health and digital literacy levels. Participated women who have, or family members, previous chronic diseases were more health literate than other women who did not have regular communication with health care providers and continuous exposure to the American health system personnel and services. Customized cultural and linguistic health education and applying interventions can be considered by Muslim community leaders and public health professionals to target all Muslim immigrant women targeting critical clinical and public health issues and diseases. All respondents used different computerized devices for various digital daily tasks. Most of them used these devices for health-related purposes. We recommend building a cultural and linguistic website or a mobile application to guide these immigrant women on locating, accessing, and using the health resources available for their communities. The immigrant population needs to be educated about the importance of earning digital capabilities to efficiently conduct their daily tasks for better health and life quality.

The pandemic increased the awareness of the importance of telehealth and virtual medicine services among the participating women. However, the highest awareness was among first-generation participating women, who have had prior Knowledge and education about health information technologies. More health

campaigns about the importance of accepting and adopting different health information technology tools and strategies could be done to increase further the Knowledge, attitude, and practice (KAP) among disadvantaged, first-generation immigrant women. To further facilitate the adoption of telehealth services, the service providers can customize their amenities to suit the users' cultural, social, and linguistic characteristics and values.

Author Contributions

The first author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation. The second, third, and fourth authors confirm responsibility for phase two's data collection and results.

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