

ORIGINAL RESEARCH ARTICLE

Impact of an educational intervention on deaf and hard hearing females' knowledge and health beliefs regarding cervical cancer in Tabuk, Saudi Arabia: A theory-based study

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Abstract

Deaf people experience barriers to communication that prevent access to health care and information that puts them at increased risk for lack of knowledge about prevention and early detection approaches to cancers. With decreased screening, they may be at a higher risk of discovering cervical cancer (CC) at a late stage. This study aimed to evaluate the impact of an educational intervention on deaf and hard hearing females' knowledge and health belief regarding cervical cancer in Tabuk, Saudi Arabia. A quasi-experimental study was performed from the beginning of April till the end of October 2021 using a convenience sample of 33 deaf and hard hearing married females students from Al-Amal center for deaf and hard hearing females and Tabuk University. The data were collected using an interview schedule composed of three parts translated to American Sign Language: background variables (basic data), cervical cancer knowledge quiz, and health belief model scale for CC and Pap smear test. About 75.8% of the participants were older than 20 years. The intervention-based HBM showed significant improvement in the overall knowledge score after the intervention compared to pre-intervention (FET = 16.345 P = 0.000). Moreover, significant enhancements (P<0.05) in all HBM construct scores after the HBM intervention compared to the pre-intervention. HBM-based educational interventions can be useful educational modalities for deaf and hard hearing populations. This intervention effectively enhanced the deaf and hard hearing females' overall knowledge and health beliefs scores. (*Afr J Reprod Health* 2022; 26[7s]: 52-60).

Keywords: Knowledge, health belief model, cervical cancer, persons with hearing impairments

Résumé

Les personnes sourdes rencontrent des obstacles à la communication qui empêchent l'accès aux soins de santé et à l'information qui les expose à un risque accru par manque de connaissances sur les approches de prévention et de détection précoce des cancers. Avec une diminution du dépistage, elles peuvent courir un risque plus élevé de découvrir un cancer du col de l'utérus (CC) à un stade tardif. Cette étude visait à évaluer l'impact d'une intervention éducative sur les connaissances et les croyances en matière de santé des femmes sourdes et malentendantes concernant le cancer du col de l'utérus à Tabuk, en Arabie saoudite. Une étude quasi-experimentale a été réalisée de début avril à fin octobre 2021 en utilisant un échantillon de convenance de 33 étudiantes mariées sourdes et malentendantes du centre Al-Amal pour femmes sourdes et malentendantes et de l'Université de Tabuk. Les données ont été recueillies à l'aide d'un programme d'entretien composé de trois parties traduites en langue des signes américaine: variables de base (données de base), quiz sur les connaissances sur le cancer du col de l'utérus et échelle du modèle de croyance en matière de santé pour le test CC et le test de Pap. Environ 75,8 % des participants avaient plus de 20 ans. Le HBM basé sur l'intervention a montré une amélioration significative du score global des connaissances après l'intervention par rapport à la pré-intervention (FET = 16,345 P = 0,000). De plus, des améliorations significatives (P <0,05) dans tous les scores de construction HBM après l'intervention HBM par rapport à la pré-intervention. Les interventions éducatives basées sur le HBM peuvent être des modalités éducatives utiles pour les populations sourdes et malentendantes. Cette intervention a amélioré efficacement les scores globaux de

Mots-clés: Connaissances, modèle de croyance en la santé, cancer du col de l'utérus, personnes ayant une déficience auditive

Introduction

Deaf people experience barriers to communication that prevent access to health care and information that puts them at increased risk for lack of knowledge about prevention and early detection approaches to cancers. Consequently, most of the deaf population may discover cancer in an advanced stage¹. Worldwide, Cervical Cancer (CC) represents the 4th leading cause of cancer-related females mortality. In 2020, it was reported that 604 000 CC cases were diagnosed, and 342 000 of them died from it².

In Saudi Arabia, CC is considered the 8th most common cancer among females aged 14 - 45 years. The Human cervical Papilloma Virus (HPV) -16/18 infection rate among Saudi women was reported to be 2.5% of the general population at any time in their lives, and 72.4% of invasive CC are caused by HPV 16 or 18³. Recurrent HPV infection is considered the primary risk factor for CC, with approximately 99.7% of CC tumors accompanied by HPV infection as it transmits primarily through sexual contact. Other cofactors for CC are early onset of sexual activity, history of sexually transmitted infections, several sexual spouses, history of vaginal cancerous lesions, smoking, and oral contraceptive pills^{4,6}. HPV vaccination is the main stone of long-term CC prevention. Several studies promised that CC incidence might significantly decrease or eliminate after five decades of complete HPV vaccination. The same group studies assured the HPV vaccine safety efficiency. In addition, Early CC screening and prevention strategies, health lifestyle, and early diagnosis and treatment are essential to decrease the CC burden^{7,8}.

Cervical cancer is preventable and curable depending on the stage of diagnosis and treatment efficiency. Special education about CC screening and treatment is an important factor in prevention strategies⁹. Clinical results related to deaf patients suffering from cancer are still poorly understood, emphasizing the urgent need for a model of care to promote skilled oncological care for this marginalized populations¹⁰. Around 37% of deaf participants in a previous study reported no

knowledge regarding CC¹¹. In Saudi Arabia, the lack of HPV-related knowledge and negative attitude toward it may exaggerate the CC problem. This situation highlights the critical need to promote public awareness regarding CC screening and preventive measures¹². Health interventions to increase adherence to CC screening are needed through tailored behavioral modification and communication strategies that report females' beliefs concerning CC screening barriers and highlight the CC perceived severity and susceptibility¹³.

The Health Belief Model (HBM) is used widely when behavior change is required as it helps to understand human health-related behaviour¹⁴. HBM is a health behavior change model proposing that individuals' attitudes, perceptions, and beliefs regarding health problems determine their readiness to uptake CC preventative and screening measures¹⁵. Based on HBM, the decision to contribute to preventive and screening programs is affected by numerous factors such as perceived disease susceptibility, awareness of disease complication (perceived seriousness), perceived screening benefits, barriers, and cost¹⁶. To our knowledge, no previous studies applied HBM educational intervention to improve deaf and hard hearing female knowledge and health beliefs regarding CC in Saudi Arabia. Therefore, the current study was designed in response to the urgent need to reach such a negligible population and address their health educational needs regarding CC screening and prevention. This study aimed to evaluate the impact of an educational intervention on deaf and hard hearing females' knowledge and health belief regarding CC in Tabuk, Saudi Arabia.

Methods

Study design and participants: A quasi-experimental study was performed from the beginning of April to the end of October 2021. The study included a convenience sample of 33 deaf and hard hearing married females students from Al-Amal center for deaf and hard hearing females and Tabuk University. Because of the small number of deaf and hard hearing married females in the study

setting, all the participants fitted to the inclusion criteria and agreed to join our study were included, and the application of the sample size formula was not suitable. The inclusion criteria were deaf and hard hearing female students, married, reproductive age (15-45years), can utilize and understand sign language, free from mental or any other disabilities, and consent to participate in the study.

Data collection instruments

An interview schedule (translated to American Sign Language by a sign language specialist) was used for data collection. The interview schedule is composed of three parts.

Part I: background variables of the study participants: it was developed to collect data such as age, residence, education, mother education, consanguinity with husband, disability type, family history of CC or cancer in general, current history of contraceptive use, history of pap smear screening and the HPV vaccine, age at marriage, marriage duration, gravidity, and parity.

Part II: CC knowledge quiz was developed to test the females' knowledge and understanding of CC. It is composed of eleven dichotomous or multiple choices questions. The questions assessed areas of knowledge as definition, symptoms, risk factors, diagnostic measures, treatment modalities, preventive measures, HPV, the frequency for CC screening, is CC curable if detected early, are the girls should be vaccinated against HPV, and if CC can be prevented. For the dichotomous questions, the correct answer scored two, and the incorrect answer scored zero. Regarding the multiple-choice questions, the correct and complete answer scored two, the incomplete answer scored one, and the incorrect answer or don't know scored zero. The total quiz score was 22, and the participant was considered to have poor knowledge (less than 11), fair (11-16.5), and good (16.6 to 22) based on her score.

Part III: HBM scale for CC and Pap smear test: It was developed by Guvenc *et al.* 2011. The scale composed of 35 items distributed to five subscale susceptibility to CC (3 items), perceived seriousness of CC (7 items), barriers to Pap smear test (14 items), Pap smear test benefits (4 items), and health motivation (7 items). For each item, the participants have to select one of five alternatives: strongly agree= 5, agree =4, neutral =3, disagree =2,

and strongly disagree=5). Higher scores reveal greater feelings regarding the construct. All scales have a positive association with CC screening behavior except for barriers items, which have a negative association. Cronbach's alpha coefficients results for the five subscales ranged from (0.62 to 0.86)¹⁷.

The interview schedule was evaluated for face, content, and construct validity by five experts from obstetric nursing and a statistician. The reliability for part II was $r=0.82$ using the Cronbach alpha coefficient test.

Fieldwork and program implementation

The fieldwork was conducted through a collaboration between the investigators and the sign language specialist. The arrangement was made in the data collection settings to provide a class and projector for the sign language educational sessions. The health belief model educational intervention was done following four consecutive phases.

Phase I needs assessment: This phase carried out from April to May 2021, the study instruments evaluated the deaf females' knowledge and health beliefs regarding CC. The pre-test results were used to determine the knowledge deficit areas and the poor health beliefs regarding CC to guide the educational program designing and implementation. The results were also used for comparison with the post-test.

Phase II: planning: This phase took place from May to the beginning of June 2021. The educational intervention was designed in five consecutive sessions to address the participants' CC knowledge in general (session 1), perceived susceptibility, seriousness (session 2), barriers and benefits of Pap smear test (session 3), and the health motivation activities to perform CC self-protection measures (session 4). The fifth session was left for questioning and exploring misconceptions related to CC and ending celebration. Different instructional materials were prepared for the intervention as PowerPoint presentations, colored papers and pens, audiovisuals, and other consumable materials. The instructional materials and education session planning were designed based on the pre-test results.

Phase III: intervention implementation: This phase took place from June to the beginning of

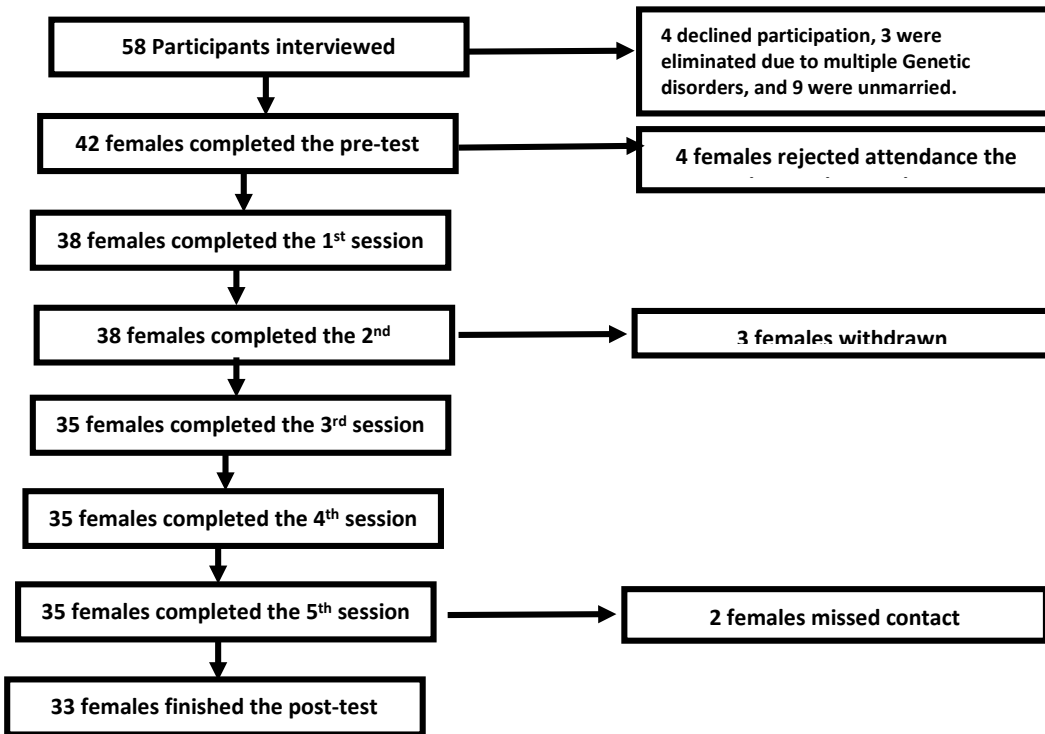


Figure 1: Participant's flowchart

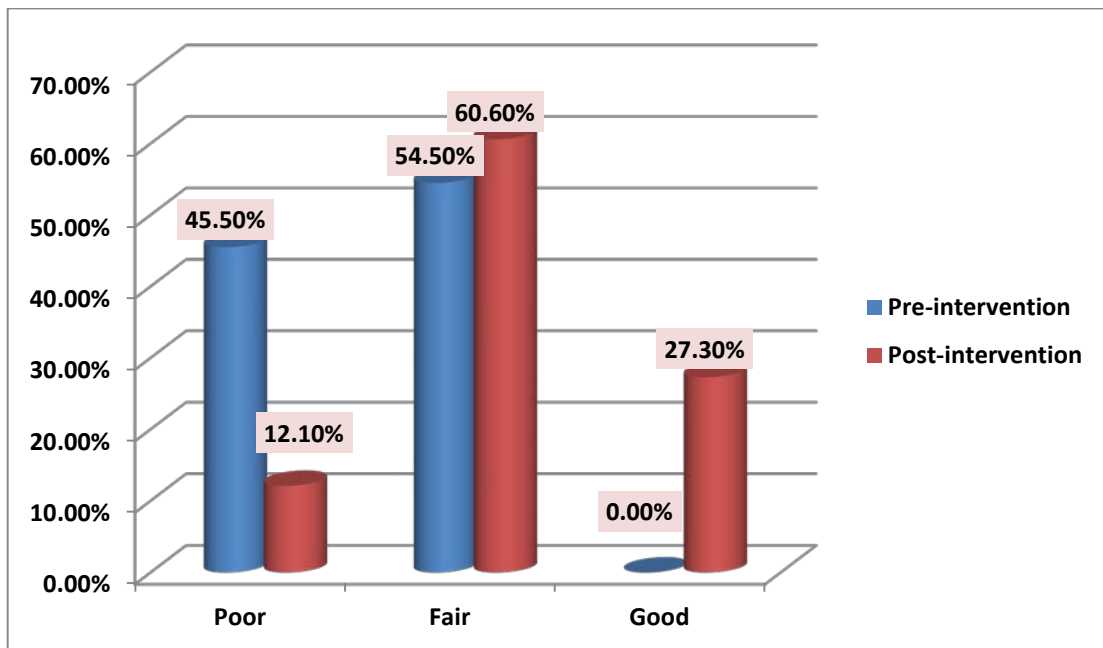


Figure 2: Participants' overall knowledge pre and post-intervention (n=33)

August 2021. The appropriate times to implement the educational sessions were arranged with cooperation with each setting's administration (Al-Amal center for deaf and hard hearing females and Tabuk University). Each session was arranged for 5-7 participants. After taking the informed consent

and completing the basic data, the participants were informed about the importance of completing the five sessions. The educational sessions were conducted according to the participants' readiness and interaction. The sessions were implemented by the principal investigator and the sign language

specialist. The duration of each session lasted from 45 - 60 minutes, including periods of discussion according to their achievement, progress, and feedback. Different instructional methods were used: lecture, group discussion, brainstorming, and concept mapping. The fifth session was left for discussion, elaboration, and summarization of the program contents. The investigators arranged for the follow-up visit with setting's administration after two months.

Phase IV: Evaluation phase: Post-test was conducted two months after the fifth educational session, from the beginning of October to the end of October 2021, using the same pre-test instruments.

Data analysis was performed using Statistical Package for Social Science (SPSS, IBM, USA), version 24. Numbers and percentages were used to describe the participants' basic variables and the CC knowledge. Fisher exact test was used to test the differences between the knowledge change level between pre and post-test results. The paired T-test was used to test the participants' health beliefs change among the pre and post-test. A p-value less than 0.05 was considered significant.

Results

Background variables are depicted in Table 1. About 75.8% of the participants were older than 20 years. A great proportion (93.9%) of the participants were urban areas residents, and 90.9% were University students. Moreover, 42.4% of the participants' mothers read and write. The participants reported a family history of any type of cancer and CC 18.2% and 6.1%, respectively. Besides, 36.4% of the participants reported current use of contraception. None of the participants reported ever performing a Pap smear test or HPV vaccine. Furthermore, the mean age of marriage and marriage duration was 20.72 and 3.57 years, respectively. The participants' mean gravidity and parity were 1.42 and 0.96, respectively.

Table 2 displays significant differences ($P < 0.05$) between pre and post-intervention concerning participants' knowledge about CC. A significant improvement was found in the participants' scores post-intervention related to CC definition, symptoms, risk factors, diagnostic and preventive measures, treatment modalities, and

Table 1: Background variables of the participants (n= 33)

| Background variables | N (33) | % |
|--|-------------|------|
| Age | | |
| ≤20 | 8 | 24.2 |
| >20 | 25 | 75.8 |
| Mean (SD) years | 24.75(3.72) | |
| Residence | | |
| Urban | 31 | 93.9 |
| Rural | 2 | 6.1 |
| Education | | |
| University | 30 | 90.9 |
| Secondary School | 3 | 9.1 |
| Mother education | | |
| Illiterate | 12 | 36.4 |
| Read and write | 14 | 42.4 |
| Secondary education | 3 | 9.1 |
| University education | 4 | 12.1 |
| Consanguineous marriage | | |
| Yes | 26 | 78.8 |
| No | 7 | 21.2 |
| Type of handicaps | | |
| Hard-hearing | 12 | 36.4 |
| Deafness | 21 | 63.6 |
| Family history of cancer | | |
| Yes | 6 | 18.2 |
| No | 27 | 81.8 |
| Family history of CC | | |
| Yes | 2 | 6.1 |
| No | 31 | 93.9 |
| Current use of contraceptive | | |
| Yes | 12 | 36.4 |
| No | 21 | 63.6 |
| History of pap smear screening or HPV Vaccine | | |
| yes | 0 | 0.0 |
| No | 33 | 100 |
| Age at marriage mean (SD) years | | |
| | 20.72 | |
| | (2.63) | |
| Marriage duration mean (SD) | | |
| | 3.57 (1.88) | |
| Gravidity mean (SD) | | |
| | 1.42 (1.09) | |
| Parity mean (SD) | | |
| | 0.96 (1.04) | |

other general knowledge related to human papillomavirus and CC compared to the pre-intervention.

Figure 2 shows a significant improvement in the overall knowledge score after the intervention compared to pre-intervention ($FET = 16.345$ $P = 0.000$). The participants who had poor overall knowledge pre-intervention (45.50%) were significantly reduced to (12.10%) post-intervention.

Table 3 reflects significant enhancements ($P < 0.05$) in all HBM construct scores (perceived susceptibility, perceived seriousness, barriers to

Table 2: Participants' knowledge regarding CC before and after the educational intervention (n= 33)

| Participants' Knowledge | Pre-intervention | | | Post-intervention | | | FET | P |
|---|-----------------------|-------------------|-------------------------|-----------------------|-------------------|-------------------------|--------|--------|
| | Correct Answer No (%) | Incomplete No (%) | Incorrect Answer No (%) | Correct Answer No (%) | Incomplete No (%) | Incorrect Answer No (%) | | |
| CC Definition | 9(27.3) | NA | 24(72.7) | 20(60.6) | NA | 13(39.4) | 7.443 | 0.006* |
| CC symptoms | 6(18.2) | 11(33.3) | 16(48.5) | 20(60.6) | 10(30.3) | 3(9.1) | 16.481 | 0.000* |
| CC Risk factors | 7(21.2) | 9(27.3) | 17(51.5) | 11(33.3) | 19(57.6) | 3(9.1) | 14.605 | 0.000* |
| CC diagnostic measures | 5(15.2) | 7(21.2) | 21(63.6) | 12(36.4) | 20(60.6) | 1(3.0) | 29.877 | 0.000* |
| CC treatment modalities | 2(6.1) | 4(12.1) | 27(81.8) | 11(33.3) | 16(48.5) | 6(18.2) | 27.556 | 0.000* |
| CC preventive measures | 3(9.1) | 9(27.3) | 21(63.6) | 10(30.3) | 23(69.7) | 0(0.0) | 35.447 | 0.000* |
| Is the human papillomavirus the common cause of CC | 10(30.3) | NA | 23(69.7) | 27(81.8) | NA | 6(18.2) | 18.745 | 0.000* |
| Frequency for cervical cancer screening | 14(42.4) | NA | 19(57.6) | 30(90.9) | NA | 3(9.1) | 18.927 | 0.000* |
| CC is curable if detected early | 12(36.4) | NA | 21(63.6) | 29(87.9) | NA | 4(12.1) | 19.940 | 0.000* |
| Girls should be vaccinated against human papillomavirus | 8(24.2) | NA | 25(75.8) | 22(66.7) | NA | 11(33.3) | 12.385 | 0.000* |
| CC can be prevented | 11(33.3) | NA | 22(66.7) | 29(87.9) | NA | 4(12.1) | 22.117 | 0.000* |

* Significant at p<0.05

NA: Not applicable

Table 3: Study participants' health beliefs regarding CC before and after the educational intervention. (n= 33)

| Health beliefs | Overall scores | Pre-intervention Mean (SD) | Post-intervention Mean (SD) | Paired t-test | p |
|----------------------------|----------------|----------------------------|-----------------------------|---------------|--------|
| Perceived susceptibility | 15 | 9.51 (2.52) | 11.54 (1.95) | 3.502 | 0.001* |
| Perceived seriousness | 35 | 15.93 (4.28) | 20.81 (3.91) | 8.160 | 0.000* |
| Barriers to Pap smear test | 70 | 46.66 (7.50) | 29.66 (5.66) | 18.476 | 0.000* |
| Benefits of Pap smear test | 70 | 33.72 (8.89) | 44.12 (10.64) | 6.880 | 0.000* |
| Health motivation | 35 | 15.30 (3.79) | 21.72 (5.01) | 8.226 | 0.000* |

* Significant at p<0.05

Pap smear test, benefits of Pap smear test, and health motivation) after the HBM based educational intervention compared to the pre-intervention.

Discussion

The process of health education, guidance, and informing deaf people is one of their health rights. For deaf people, health education is a challenging demand for healthcare professionals who need special skills and education¹⁸. The current study results revealed that none of the participants had a Pap smear screening or HPV Vaccine history. This result pointed to a lack of preventive measures regarding CC screening and may be due to the lack of a national HPV vaccination program in Saudi Arabia. Similarly, the study findings of Mongsawaeng *et al.* represented a very low rate of CC screening, including a Pap smear test among their participants in Tabuk, KSA¹⁹. Furthermore, Akkour *et al.* concluded that, like all Arab women,

Saudi women displayed a very low awareness about CC screening & prevention and the value of HPV vaccination²⁰. Also, Hill *et al.* conducted a systematic review to evaluate radiation oncology care among the deaf population. They reported that deaf people had poor access to health resources and health care providers due to their poor health literacy. They further added that the health care providers' limited cultures and linguistic capabilities represent the main barrier in accessing cancer screening and preventive services¹⁰. Jradi H and Bawazir emphasized the need for screening programs as they found that the Saudi women in their study did not recognize CC screening as necessary. They considered themselves not at risk for evolving CC as they had no signs and symptoms¹².

On the other hand, Kushalnagar *et al.* studied adherence to CC screening among deaf women in the U.S. It was surprising that more than three-quarters of their participants of deaf adhered

to Pap screening²¹. The differences between the current study findings and the Kushalnagar study may be attributed to different cultures between countries. In KSA, sexual relations are limited within the marriage framework, so the Pap smear screening and HPV vaccine are rare. Furthermore, the deaf marginalized population has low awareness about the available preventive and screening services.

The current study results showed a significant improvement in the overall knowledge score after the intervention compared to pre-intervention. In the same line with the current study, *Palmer et al.* used American Sign Language to make virtual genetic cancer education for the deaf population. They observed a significant improvement in the participants' knowledge after virtual genetic cancer education compared to before the education²². In addition, *Yao et al.* conducted a video-based educational program to evaluate its effect on CC knowledge with a sample of hearing women and a sample of Deaf women. They reported total CC knowledge was a significantly higher post-educational intervention for both groups. They recommended distributing this video in the deaf community and their hearing and hard-of-hearing networks²³. Moreover, *Choe et al.* applied a video-based educational tool to evaluate the effect of CC education for deaf women. They found that the experimental group's knowledge increased significantly after the intervention than baseline knowledge¹.

Our study is the first one that used theory-based intervention for the deaf population in Saudi Arabia. HBM was used as a framework for other general populations worldwide, but it was not used for the deaf population in Saudi Arabia. The current study results showed significant enhancements in all HBM construct scores (perceived susceptibility, perceived seriousness, barriers to Pap smear test, benefits of Pap smear test, and health motivation) after the HBM based educational intervention compared to the pre-intervention. These findings were supported by *Saei Ghare Naz et al.*, who concluded that the various health educational interventions that are concerned with behavior change offer an important element in CC preventive programs. Health care professionals can determine the educational models based on the participant's needs and readiness²⁴. In addition, *Samami et al.* evaluated the impact of HBM-based educational

intervention on the women CC knowledge, attitudes, and practices regarding Pap smear. They found that the HBM construct and overall score were significantly improved after the educational intervention compared to pre-test²⁵. Besides, the effectiveness of HBM in improving the population knowledge, perception, and self-efficacy regarding CC screening and prevention was emphasized by²⁶⁻²⁸. Deaf people are one of the minority populations ignored in health education efforts. Therefore, this study showed the importance of directing health educational studies on individual minority populations as the HBM educational programs positively affected their knowledge and health beliefs.

Study limitations

The sample was relatively small, drawn from a single geographic region of deaf and hard-hearing married females living in Tabuk city which may limit the generalization of the findings to other deaf women living in Saudi Arabia. To deal with these limitations, further studies are recommended in different geographical areas in KSA that include different parts of deaf Saudi populations.

Ethical approval

The study proposal was approved by the deanship of scientific research at Tabuk University; then, it was approved by the ethical committee. The formal lines of authorities were followed to gain agreement from the study settings. The participants' informed consent was taken using the American Sign Language. The participants were informed about the data confidentiality and the right to refuse participation or withdraw from the study at any time.

Conclusion

The study concluded that HBM-based educational interventions could be useful educational modalities for deaf and hard-hearing populations. This intervention significantly enhanced the deaf and hard hearing females' overall knowledge and health beliefs scores after the intervention compared to the pre-intervention. Further use of HBM-based education for this marginalized group is warranted for cervical cancer and other health issues.

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Consent for publications

The authors have read and approved the publication of the manuscript in its current form. This manuscript has not been submitted for publication elsewhere and has not been previously published.

Competing interests

The authors declare they have no conflict of interest.

Authors' contributions

El Sayed- The conception and design of the study and analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, final approval of the version to be submitted. *Al-Thubaity*- Drafting the article and revising it critically for important intellectual content, final approval of the version to be submitted. *Nahari*- Drafting the article or revising it critically for important intellectual content, final approval of the version to be submitted. *Alshahrani*- The conception and design of the study and analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, final approval of the version to be submitted. *Ibrahim*- The conception and design of the study, drafting the article or revising it critically for important intellectual content. *Elgzar*- The conception and design of the study and final approval of the version to be submitted. *Zaien*- drafting the article and revising it critically for important intellectual content. *Alqahtani*- Final approval of the version to be submitted. *Bazuhair*- Analysis and interpretation of data, drafting the article. *Said*- The conception and design of the study and revising the article critically for important intellectual content.

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