Knowledge, attitudes, and practices toward cervical cancer prevention among women in Khartoum state, Sudan

Emmanuel Edwar Siddig  
Mycetoma Research center, University of Khartoum, Khartoum, Sudan

Ayman Ahmed  
Sudanese National Academy of Sciences, Khartoum, Sudan

Eiman Siddig Ahmed  
Mycetoma Research center, University of Khartoum, Khartoum, Sudan

Mona Ali Mohammed  
Nile University, Faculty of medical laboratory sciences, Department of medical parasitology and entomology, Khartoum, Sudan

Ezzan Kunna  
Public Health Programme, University of Limerick, Limerick, Ireland

Sarah M El-sadig  
Department of Medicine – Faculty of Medicine- University of Khartoum, Khartoum, Sudan

Yousif Ali  
Health Emergencies and Epidemics Control General Directorate, Sudan Federal Ministry of Health, Khartoum, Sudan

Nouh Saad Mohamed (✉ nouh_saad@outlook.com)  
Molecular Biology Unit, Sirius Training and Research Centre, Khartoum, Sudan

Eman Taha Ali  
University of Khartoum. Department of Histopathology and Cytology, Khartoum, Sudan

Research Article

Keywords: Cervical cancer, Pap smear, HPV, Knowledge, Attitude, Practice

Posted Date: November 3rd, 2021

DOI: https://doi.org/10.21203/rs.3.rs-940404/v1

License: © This work is licensed under a Creative Commons Attribution 4.0 International License.  
Read Full License
Abstract

Background

Cervical cancer is considered as the third most leading cause of death among female worldwide with most of the deaths were found to occur in the developing countries. Several etiological agents were studied however Human papilloma virus (HPV) is identified as the most common etiological agent that involved in the induction of cervical cancer. The aim of our current study was to assess the Knowledge, attitudes, and practices toward cervical cancer prevention among women in Khartoum state, Sudan.

Methods

this is a descriptive cross-sectional community-based study. An electronic questionnaire was used for data collection. Descriptive statistics like frequency, mean and percentage were computed using SPSS version 20.0 software program.

Results

About 716 females in age between 18 and 74 years old with a mean age 27.58 years (STD 8.74 years) have enrolled in this study. 93.7 of them are educated at university level or higher. Although that 580 (81.0%) of our study participants have heard about cervical cancer only 29 (4.1%) were vaccinated against HPV as a preventive measure against the disease.

Conclusion

We highly recommended conducting health education sessions for both the Obstetrician and females in reproductive age regarding the benefit of the Pap test in the early detection of the cervical intraepithelial lesions and malignancy as well as HPV vaccination should be introduced in the local healthcare facilities

Background

Cervical cancer, also called cervical carcinoma, is considered one of the most common cervical tumors affecting the female genitalia. This type of cancer affects females worldwide, with 80% of the cases reported from developing countries [1–3]. In Sudan, cervical cancer has been reported as the second most common cancer among female patients between 1954 and 1961 [4]. Furthermore, previous studies have demonstrated that cervical cancer represents about 8.2% of all cancer types in females during 2000 – 2006 [5]. Currently, cervical carcinoma is estimated to be more than eight thousand cases reported annually. They are usually presented at a late stage of the disease [6].
Different etiological factors had been attributed to the development and progression of cervical carcinoma. The Human papillomavirus (HPV) is considered the most common etiological agent that leads to the development of cervical cancer [7, 8]. Fortunately, cervical cancer is preventable through early and regular screening, eventually leading to better case management [9–11]. The screening program for cervical carcinoma has successfully led to cancer detection in an early stage using Papanicolaou smear (Pap smear), which is considered the gold standard tool for early detection of the cancerous and precancerous lesions of the cervix [1–8, 10, 12]. Adopting Pap smear as a screening tool for the detection of cervical cancer in the population-based screening programs has successfully reduced the incidence of late cervical carcinoma up to 85% in several developed countries over the past decades. About 99.7% of all cervical cancers are associated with human papillomavirus infection [11].

Cervical cancer can be prevented by either preventing human papillomavirus (HPV) infection and/or by the early detection and treatment of the precancerous lesions before their progression into invasive cancer [13, 14]. However, cervical carcinoma is a highly preventable disease in western countries. Sadly, it is one of the leading causes of death in African women [15]; this is likely due to a shortage in screening, early detection, and poor case management of the disease. Multiple factors contribute to the incompetent cervical cancer screening in low-income countries, such as inadequate national screening system, shortage of trained healthcare expertise, limited access to healthcare, and lack of public awareness [16–18]. A study conducted in Sudan has demonstrated that lack of awareness, poverty, and limited health insurance in the country resulted in deficient access to health care services leading to late diagnosis of cervical cancer [10]. Another study in the Congo revealed that a low level of knowledge, lack of good health practices, and poor attitude toward cervical cancer were associated with high incidence and mortality rates [17]. It has been experimentally shown that raising awareness about cervical cancer's risk factors and symptoms were associated with a significant increase in the numbers of patients diagnosed in early stages I and II [19].

In Sudan, there is limited data on women's awareness of cervical cancer. Therefore, this study was designed to assess women's level of knowledge, attitude, and practice regarding cervical cancer and their beliefs about the disease risk factors and preventive methods. Furthermore, investigating the link between the marital status, socioeconomic level, education level, and other factors to women's knowledge and practices towards cervical cancer. Besides exploring the obstacles of early screening and other preventive measures.

**Methods**

A community-based cross-sectional study was conducted in Khartoum state, Sudan, from 01st August 2020 till 01st September 2020 to assess women's knowledge, attitudes, and practice (KAP) toward cervical cancer prevention. We have adopted a well-established KAP questionnaire to be used in this study through an electronic survey (Google Form). The questionnaire was eventually sent to different groups in social media. English and Arabic versions of the questionnaire were developed and translated into an Arabic version. The English and Arabic versions of the questionnaire were pre-tested among a
small group of women to validate and modify the questionnaire to ensure that the questions are simple
to be understood by the interviewees and data collectors without losing their power to capture the
accurate information.

The questionnaire included 28 questions covering demographic and socioeconomic characteristics,
knowledge of cervical carcinoma, its risk factors, the screening methods including Pap smear, preventive
measures towards HPV, and the vaccination programs. Demographic data comprised age, education
level, occupation, family monthly income, and marital status. Regarding reproductive-health data, we
asked about the number of children, presence or absence of a family history of cervical carcinoma,
history of sexually transmitted diseases, methods used for family planning, number of sexual partners,
and smoking and alcohol consumption. Furthermore, questions regarding the knowledge on cervical
carcinoma included were; have you ever heard about cervical cancer; also, what is the most important risk
factor of cervical cancer. The questionnaire was designed as a close-ended question (Yes, No, and I do
not know), while some other questions had multiple answers.

The online form questionnaire experiment was performed in accordance with relevant guidelines and
regulations. A pre-questionnaire filling statement was included as an informed consent of agreeing to
participate was obtained from all the participants.

**Statistical analysis:**

The study data were homogenized to be exploitable using Microsoft Office software (version 2109). A
verification step based on the respondent age groups to ensure the sample’s representativeness
compared to the source population was made. No significant difference was observed between the
sample population and the general population. The mean, standard deviations, and frequency of each
variable among the respondent were calculated. The Chi-square test was used to test the significance
level; a P value <0.05 was considered statistically significant. Also, Multiple linear regression models were
tested to predict the effectors on participants’ knowledge, attitude, and practice. All statistical analysis
was conduct using the Statistical Package for Social Sciences (SPSS version 20).

**Results**

**The socio-economic characteristic of participants:**

The study participants consisted of 716 females. The minimum age among the participants was 18, and
the maximum was 74; the mean was 27.58 years (STD 8.74 years). Age was grouped into six different
age groups of ten years intervals. The most frequent age group was 20 to 30 years; 440 (61.5%), followed
by 31 to 40 years; 121 (16.9%). The remaining age groups constituted 94 (13.1%), 41 (5.7%), 14 (2.0%),
and 6 (0.8%), for the age groups less than 20 years, 41 to 50 years, 51 to 60 years, and more than 60
years, respectively. Among the participants, 35.1% were students, while 22.1% were unemployed. The
remaining occupations were 10.6% medical doctors, 6.0% laboratory technologists, 5.7% were teachers,
and 5.4% were managers. The remaining 15.1% consisted of other occupations that were insignificantly frequent.

Levels of education among the participants were mostly for those who finished university; 506 (70.7%). For those who continued their higher education (postgraduate) were 165 (23.0%). Participants with pre-university education levels were 45 (6.2%) (Table 1). Participants were generating family income in range of middle (7,001 – 15,000 SDG) and high-income (> 15,000); 356 (49.7%) and 299 (41.8%), respectively. Whereas low-income participants constituted 8.5% of the study participants (61/716). According to the marital status, 448 (62.6%) participants were single, 245 (34.2%) were married, and 23 (3.2%) were divorced. One child was more frequent; 68 (9.5%) among distribution those who have children. About 70.3% of the study participants did not have children (503/716).

When we asked about the family history of cervical cancer, 148 (20.7%) of the participants didn't know about their family history. In comparison, 523 (75.0%) have confirmed no family history of cervical cancer; the remaining participants, 31 (4.3%), reported a family history of cervical cancer.

The history of sexually transmitted diseases (STDs) was not significant among most of the respondents, as 548 (76.5%) did not know whether they were previously infected with STDs or not. While those who confirmed no previous or current infection were 163 (22.8%), only 5 (0.7%) participants indicated previous STDs infection.

Respondents who reported avoiding contraceptives were 440 (61.5%), while 149 (20.8%) stated they were using contraceptives for family planning. Around 127 (17.7%) did not know what contraceptives were or their use. Not smoking was reported by 658 (91.9%), whereas current smokers and former smokers were 37 (5.2%) and 21 (2.9%), respectively. Only 21 (2.9%) drink alcohol on certain occasions, while 695 (97.1%) do not drink alcohol.

The number of lifetime sexual partners mainly was within one or two partners; 184 (25.7%), while those with more than two partners were only 11 (1.5%). Participants with no sexual life partners were 521 (72.8%) (Table 1).

A total of 580 (81.0%) heard about cervical cancer, while 136 (19.0%) did not hear about it. However, a total of 229 (32.0%) have heard about the Pap test, while 487 (68.0%) did not hear about the Pap test. The knowledge about cervical cancer concerning early detection by screening was known among 421 (58.8%) participants, whereas 285 (39.8%) did not know about cervical cancer screening. When we investigated the risk factors for cervical cancer perceived by the participants, 109 (15.2%) assumed it to be related to alcohol drinking. In comparison, 51 (7.1%) considered it is related to giving birth to many children, 118 (16.5%) to age, 335 (46.8%) to having many sexual partners, 300 (41.9%) to having HPV infection, 256 (35.6%) to the prolonged use of birth control pills, and 162 (22.6%) related to smoking.

The knowledge concerning the transmission of HPV through sexual contact was stated by 335 (46.8%) respondents. In contrast, 318 (44.4%) did not know about it. Regarding the best time to be vaccinated
against HPV, participants who did not know were 381 (53.2%); however, 110 (15.4%) pointed the best time for vaccination is to be after marriage, 17 (2.4%) after first sexual contact, or childbirth, and 208 (29.1%) considered the best time for vaccination is before the first sexual contact. When we checked the knowledge of the participants about whether cervical cancer is preventable via vaccination, 163 (22.8%) answered yes, while 167 (23.3%) answered no, and 386 (53.9%) did not know about cervical cancer prevention. Accordingly, the overall knowledge about HPV and cervical cancer and their associated risk factors was significantly related to the participant's age group; specifically, the age group between 20 and 30 years old had the highest knowledge score among all other age groups. (P value 0.000) (Table 2). Additionally, the knowledge about cervical cancer and HPV was positively associated with the highest education levels; university and post-university groups. (P value 0.000) (Supplementary Table S1).

We asked the participants if they were offered a free cervical cancer screening would they do it or not. A total of 112 (15.6%) did not respond, while 521 (72.8%) agreed to be screened and 83 (11.6%) refused to be screened. Also, those confirmed to be screened for cervical cancer within the next three years were 256 (35.8%). Respondents' attitudes and practices towards cervical cancer screening were also significant among different age groups. The willingness to get cancer screening was highest among the age group of 20 – 30 years old. (p-value .001). Again, cancer screening willingness was also highest among the university and post-university group 109 (96%). (Supplementary Table S2). Nevertheless, 112 (15.6%) of study participants have expressed that their reason for refusing the cervical cancer screening was mainly because of their psychological fear of finding out that they have it already.

Those who had HPV vaccination were 29 (4.1%), while those who did not get the vaccine were 687 (95.9%), the percentage of vaccine recipients was insignificantly associated with the age group (P-value 0.74). The question about willingness to receive the HPV vaccine for free was yes for 473 (66.1%), the frequency had slightly decreased to 52.9% (379/716) when they were asked whether they are willing to be vaccinated even if they have to pay for it. Regarding vaccine refusal reasons, 83 (11.6%) responded that they do not trust the vaccine safety, 75 (10.5%) considered there is no need to have the vaccine as they are not sexually active, 43 (6.0%) were due to the cost of vaccine might be very high. (Table 3). The correlation of the educational levels with the respondent practices related to HPV and cervical cancer is shown in Supplementary Table S3.

The regression models to predict the effectors on participants' knowledge, attitude, and practice were showing a low standard deviation of the estimate with higher values of the adjusted R square; [R: 0.041, 0.017, and 0.006; STD: 1.527, 0.417, and 0.426] indicates that the participant's knowledge, attitude, and practice levels are more influenced by the combination of occupation, educational level, family income, and marital status all together than affected by each affecter separately (Table 4).

**Discussion**

Recently the availability of HPV vaccine and the massive development in screening programs decreased the rate of cervical cancer-related mortality significantly [20]. However, the application of these health
measures is highly affected by the level of awareness for the early signs and risk factors among the general population and medical staff [10].

According to our current study population, 386 (53.9%) of the participants were not aware that cervical cancer is a preventable disease. And 68% of them had not heard about the Pap test. This indicates poor awareness regarding cervical cancer prevention and screening programs. This finding agrees with several studies conducted in developing countries such as Ghana, Ethiopia, and Iraq, in which they showed that only 3.3%, 28.79%, and 21.4% have heard about the Pap test, respectively [21–23]. Furthermore, according to Ferlay and associates, 80% of cervical cancer death worldwide occurs in such countries; thereby, the level of awareness can be considered the main factor for reducing cervical cancer-related death [24]. However, despite the poor knowledge about the Pap test, the knowledge about cervical cancer concerning early detection is relatively high, which is known among 421 (58.8%) participants. This may be attributed to general knowledge about the advantages of cancer early detection, which indicates that the application of the Pap test as an essential health measure among primary health facilities is poor and need more attention from health staff. Eventually, this can contribute to health staff training as well as public awareness about Pap test importance.

Regarding cervical cancer risk factors awareness, 335 (46.8%) of the participants reported having many sexual partners as a significant risk factor; this is followed by 300 (41.9%) citing HPV as the important risk factor to acquired cervical cancer. Our results are in line with a study conducted by Touch and associates, who demonstrated that having multiple sexual partners and HPV were selected as the most risk factors for cervical cancer in their study that assessed the Knowledge of Cambodian females regarding cervical cancer [25]. Additionally, this is in line with the result findings reported in South Africa and Iraq, in which 48.5% and 36.9% of the participants selected HPV as a causal factor for cervical cancer, respectively [26, 27]. Interestingly, this is per scientific data indicating the direct relationship between sexual behaviors and cervical cancer as eventual results for HPV transmission [28, 29].

Generally, our studied population had good general knowledge regarding the link between HPV and cervical cancer. According to a systematic review study that consisted of 39 studies conducted in 11 countries, the overall understanding of the public regarding HPV and cervical cancer risk is poor [30]. However, several studies support that the HPV is related to several other squamous epithelial carcinomas in Sudan [31–33], emphasizing that the gap between HPV etiology in our study population and HPV awareness is still significant. Therefore, a real need for more effort to eliminate this etiological factor.

Women aged between 20 and 30 years old and those with university and post-university levels were associated with good knowledge. Respondents’ attitudes and practices towards cervical cancer screening were also significant among this age group. However, respondents’ attitudes and practices were insignificantly associated with education level. This finding is inconsistent with Chinese studies reporting that the education level is the only significant factor related to positive attitudes [34]. Nevertheless, this study agrees with our study regarding that knowledge alone is an insufficient factor for positive attitudes. Thus, there are other important factors to improve the awareness among the population, e.g., education level.
According to vaccine status and attitudes; only 29 (4.1%) of study participants had been vaccinated against HPV, reflecting a meager percentage of vaccinated women in our population comparing to international vaccine program target coverage among developing countries, which exceeds 85% in most of these countries [35]. However, 473 (66.1%) of our participants are ready to receive it. Regarding the vaccine refusal reasons, lack of vaccine trust and vaccine efficiency was the most common response. This indicates that the knowledge about vaccine importance and efficiency among the national health facilities can be considered as HPV vaccine implementation barrier in our population. Several studies also reported similar results indicating that spreading vaccine knowledge with simple explanation is a determining factor for vaccine implementation success [36–38].

**Conclusion**

The results of our study indicated that Sudanese females had a low awareness of cervical cancer screening programs, and a minority of the population had practiced the Pap test; however, the willingness of our participants to get the HPV vaccination is high. Therefore, we highly recommended conducting health education sessions for both the Obstetrician and females of reproductive age regarding the benefit of the Pap test in the early detection of cervical intraepithelial lesions and malignancy, and HPV vaccination should be introduced in the local healthcare facilities.

**Abbreviations**

HPV
Human Papillomavirus
KAP
Knowledge, Attitudes, and Practice
Pap
Papanicolaou
STDs
Sexually Transmitted Diseases.

**Declarations**

**Ethics approval and consent to participate**

This study protocol has been reviewed and approved under the registration number RECNU-10035 by the Nile University Research Ethics Committee.

**Consent to publish**

Not Applicable.

**Availability of Data and Materials**
The datasets generated and/or analysed during the current study are included in within the manuscript and its supplementary information files.

**Competing interests**

The authors declare that they have no competing interests.

**Funding**

Not Applicable.

**Authors' contributions**

EES, NSM, and ETA conceived and designed the study; EES, ESA, AA, and YA performed the study; NSM, EES, AA, and MAM analyzed the data; EES, ETA, EK, SME, and AA wrote the manuscript. EES, NSM, AA, and ETA revised the manuscript. All authors read and approved the final manuscript.

**Acknowledgements**

The authors would like to thank all the respondents who participated in filling up the questionnaires and helped in the study.

**Author's Information**

Emmanuel Edwar Siddig: Mycetoma Research center, University of Khartoum, Khartoum, Sudan. Nile University, Faculty of Medicine, Khartoum, Sudan.

Ayman Ahmed: Sudanese National Academy of Sciences, Khartoum, Sudan.

Eiman Siddig Ahmed: Mycetoma Research center, University of Khartoum, Khartoum, Sudan.

Mona Ali Mohammed: Nile University, Faculty of medical laboratory sciences, Department of medical parasitology and entomology, Khartoum, Sudan.

Ezzan Kunna: Public Health Programme, University of Limerick, Limerick, Ireland.

Sarah M El-sadig: Department of Medicine – Faculty of Medicine- University of Khartoum, Khartoum, Sudan.

Yousif Ali: Health Emergencies and Epidemics Control General Directorate, Sudan Federal Ministry of Health, Khartoum, Sudan.

Nouh Saad Mohamed: Molecular Biology Unit, Sirius Training and Research Centre, Khartoum, Sudan.

Eman Taha Ali: University of Khartoum. Department of Histopathology and Cytology, Khartoum, Sudan. Ewha Woman's University, Department of Molecular medicine, South Korea. Sunchon National University.
References

1. Khanna D, Khargekar N, Budukh A: Knowledge, attitude, and practice about cervical cancer and its screening among community healthcare workers of Varanasi district, Uttar Pradesh, India. Journal of family medicine primary care 2019, 8(5):1715.

2. Varughese J, Richman S: Cancer care inequity for women in resource-poor countries. Reviews in Obstetrics Gynecology 2010, 3(3):122.

3. Narayana G, Suchitra MJ, Sunanda G, Ramaiah JD, Kumar BP, Veerabhadraprappa K: Knowledge, attitude, and practice toward cervical cancer among women attending Obstetrics and Gynecology Department: A cross-sectional, hospital-based survey in South India. Indian journal of cancer 2017, 54(2):481.

4. Daoud E, El Hassan A, Zak F, Zakova N: Aspects of malignant disease in the Sudan. Cancer in Africa Nairobi: East African Publishing House 1968:43–50.

5. Elasbali AM, Hussein ARA, Gadelkarim AH: Cervical and oral screening for HR-HPV types 16 and 18 among Sudanese women cervical lesions. Infectious agents and cancer 2012, 7(1):1–6.

6. Husain N, Helali T, Domi M, Bedri S: Cervical cancer in women diagnosed at the National Health Laboratory, Sudan: a call for screening. Sudan Journal of Medical Sciences 2011, 6(3):183–190.

7. Sammarco ML, Tamburro M, Pulliero A, Izzotti A, Ripabelli G: Human Papillomavirus Infections, Cervical Cancer and MicroRNAs: An Overview and Implications for Public Health. Microrna 2020, 9(3):174–186.

8. Almobarak AO, Elbadawi AA, Elmadhoun WM, Elhoweris MH, Ahmed MH: Knowledge, attitudes and practices of sudanese women regarding the Pap smear test and cervical cancer. Asian Pacific Journal of Cancer Prevention 2016.

9. Mwaka AD, Orach CG, Were EM, Lyratzopoulos G, Wabinga H, Roland M: Awareness of cervical cancer risk factors and symptoms: cross-sectional community survey in post-conflict northern Uganda. Health Expectations 2016, 19(4):854–867.

10. Johnson CA, James D, Marzan A, Armaos M: Cervical cancer: an overview of pathophysiology and management. In: Seminars in oncology nursing: 2019. Elsevier; 2019: 166–174.

11. Yoon YA, Kim B-H, Heo S-H, Kim HJ, Choi Y-J: Comparative evaluation of the Omniplex-HPV and RFMP HPV PapilloTyper for detecting human papillomavirus genotypes in cervical specimens. Archives of virology 2018, 163(4):969–976.

12. Mwaka AD, Orach CG, Were EM, Lyratzopoulos G, Wabinga H, Roland MJHE: Awareness of cervical cancer risk factors and symptoms: cross-sectional community survey in post-conflict northern Uganda. 2016, 19(4):854–867.

13. Ali-Risasi C, Mulumba P, Verdonck K, Broeck DV, Praet M: Knowledge, attitude and practice about cancer of the uterine cervix among women living in Kinshasa, the Democratic Republic of Congo.
14. Tran NT, Choe SI, Taylor R, Ko WS, Pyo HS, So HC: Knowledge, attitude and practice (KAP) concerning cervical cancer and screening among rural and urban women in six provinces of the Democratic People's Republic of Korea. Asian Pacific Journal of Cancer Prevention 2011, 12(11):3029–3033.

15. Jemal A, Bray F, Forman D, O'Brien M, Ferlay J, Center M, Parkin DM: Cancer burden in Africa and opportunities for prevention. Cancer 2012, 118(18):4372–4384.

16. Almobarak AO, Elbadawi AA, Elmadhoun WM, Elhoweris MH, Ahmed MH: Knowledge, attitudes and practices of sudanese women regarding the Pap smear test and cervical cancer. 2016.

17. Ali-Risasi C, Mulumba P, Verdonck K, Broeck DV, Praet MJBwsh: Knowledge, attitude and practice about cancer of the uterine cervix among women living in Kinshasa, the Democratic Republic of Congo. 2014, 14(1):1–13.

18. Harper DM, DeMars LR: HPV vaccines—a review of the first decade. Gynecologic oncology 2017, 146(1):196–204.

19. Ebu NI, Mupepi SC, Siakwa MP, Sampselle CM: Knowledge, practice, and barriers toward cervical cancer screening in Elmina, Southern Ghana. International journal of women's health 2015, 7:31.

20. Harper DM, DeMars LRJGo: HPV vaccines—a review of the first decade. 2017, 146(1):196–204.

21. Ebu NI, Mupepi SC, Siakwa MP, Sampselle CMJjowsh: Knowledge, practice, and barriers toward cervical cancer screening in Elmina, Southern Ghana. 2015, 7:31.

22. Mengesha A, Messele A, Beletew B: Knowledge and attitude towards cervical cancer among reproductive age group women in Gondar town, North West Ethiopia. BMC Public Health 2020, 20(1):1–10.

23. Hwaid AH: Knowledge and awareness of papillomavirus and cervical cancer among college students and health care workers women in Diyala, Iraq. American Journal of Public Health Research 2013, 1(8):221–225.

24. Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S: Human papillomavirus and cervical cancer. The Lancet 2007, 370(9590):890–907.

25. Touch S, Oh J-K: Knowledge, attitudes, and practices toward cervical cancer prevention among women in Kampong Speu Province, Cambodia. BMC cancer 2018, 18(1):1–8.

26. Hoque E, Hoque M: Knowledge of and attitude towards cervical cancer among female university students in South Africa. Southern African Journal of Epidemiology Infection 2009, 24(1):21–24.

27. Hwaid AHJAJPHR: Knowledge and awareness of papillomavirus and cervical cancer among college students and health care workers women in Diyala, Iraq. 2013, 1(8):221–225.

28. Li X-M, Yang Y-B, Hou H-Y, Shi Z-J, Shen H-M, Teng B-Q, Li A-M, Shi M-F, Zou L: Interruption of HBV intrauterine transmission: a clinical study. World journal of gastroenterology: WJG 2003, 9(7):1501.

29. Freitas A, Mariz F, Silva M, Jesus A: Human papillomavirus vertical transmission: review of current data. Clinical infectious diseases 2013, 56(10):1451–1456.
30. Veerakumar A: Knowledge of Carcinoma Cervix among rural women of Reproductive age in Trichy district, India. *Journal of Comprehensive Health* 2017, 5(2):46–52.

31. Sarwath H, Bansal D, Husain NE, Mohamed M, Sultan AA, Bedri S: Introduction of p16 INK4a as a surrogate biomarker for HPV in women with invasive cervical cancer in Sudan. *Infectious agents and cancer* 2017, 12(1):1–8.

32. Ahmed HG, Mustafa SA, Warille E: Human papilloma virus attributable head and neck cancer in the Sudan Assessed by p16 INK4A Immunostaining. *Asian Pacific Journal of Cancer Prevention* 2012, 13(12):6083–6086.

33. Elnoubi OAE, Eltyeb R, Nuri BM, Alkhanjaf AAM: Genotyping of Human Papilloma Virus (HPV) Isolated from Breast Cancer Patients in Radiation and Isotopes Center Khartoum (RICK)–Sudan. *International Journal of Multidisciplinary Current research* 2017, 5.

34. Liu T, Li S, Ratcliffe J, Chen G: Assessing knowledge and attitudes towards cervical cancer screening among rural women in Eastern China. *International journal of environmental research public health* 2017, 14(9):967.

35. Gonçalves IMB, Fernandes JRM, Ribeiro F, Longatto-Filho A: HPV Vaccination in Young Girls from Developing Countries: What Are the Barriers for Its Implementation? A Systematic Review. *Health* 2020, 12(6):671–693.

36. De Figueiredo A, Simas C, Karallakis E, Paterson P, Larson HJ: Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study. *The Lancet* 2020, 396(10255):898–908.

37. Ferrer HB, Trotter C, Hickman M, Audrey S: Barriers and facilitators to HPV vaccination of young women in high-income countries: a qualitative systematic review and evidence synthesis. *BMC public health* 2014, 14(1):1–22.

38. Katz ML, Krieger JL, Roberto AJ: Human papillomavirus (HPV): college male's knowledge, perceived risk, sources of information, vaccine barriers and communication. *Journal of men's health* 2011, 8(3):175–184.

Tables

Table 1: The demographic characteristics, behavioral and history background of the study population
| Age group | Less than 20 years | 20 - 30 years | 31 - 40 years | 41 - 50 years | 51 - 60 years | More than 60 years | Total |
|-----------|-------------------|---------------|---------------|---------------|---------------|-------------------|-------|
| Occupation | Dentist | 0 (0.0%) | 11 (78.6%) | 3 (21.4%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 14 (2.0%) |
| | Engineer | 0 (0.0%) | 14 (60.9%) | 9 (39.1%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 23 (3.2%) |
| | Lab technologist | 0 (0.0%) | 34 (79.1%) | 9 (20.9%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 43 (6.0%) |
| | Manager | 0 (0.0%) | 24 (61.5%) | 11 (28.2%) | 4 (10.3%) | 0 (0.0%) | 0 (0.0%) | 39 (5.4%) |
| | Medical Doctor | 0 (0.0%) | 58 (76.3%) | 16 (21.1%) | 2 (2.6%) | 0 (0.0%) | 0 (0.0%) | 76 (10.6%) |
| | Nurse | 0 (0.0%) | 6 (85.7%) | 1 (14.3%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 7 (1.0%) |
| | Pharmacist | 0 (0.0%) | 15 (60.0%) | 10 (40.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 25 (3.5%) |
| | Student | 91 (36.3%) | 158 (62.9%) | 2 (0.2%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 251 (35.1%) |
| | Teacher | 0 (0.0%) | 17 (41.5%) | 13 (31.7%) | 8 (19.5%) | 2 (4.9%) | 1 (2.4%) | 41 (5.7%) |
| | Unemployed | 2 (1.3%) | 81 (51.3%) | 39 (24.7%) | 10 (6.3%) | 5 (3.2%) | 0 (0.0%) | 158 (22.1%) |
| | Others | 0 (0.0%) | 158 (56.4%) | 8 (20.5%) | 7 (18.0%) | 2 (5.1%) | 0 (0.0%) | 39 (5.4%) |
| Education level | Higher education | 0 (0.0%) | 82 (49.7%) | 59 (35.8%) | 20 (12.1%) | 4 (2.4%) | 0 (0.0%) | 165 (23.0%) |
| | Primary | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (33.3%) | 1 (16.7%) | 3 (50.0%) | 6 (0.8%) |
| | Secondary | 10 (25.6%) | 7 (17.9%) | 4 (10.3%) | 9 (23.1%) | 6 (15.4%) | 3 (7.7%) | 39 (5.4%) |
| | University | 83 (16.4%) | 351 (69.4%) | 58 (11.5%) | 11 (2.2%) | 3 (0.6%) | 0 (0.0%) | 506 (70.7%) |
| family income | High > 15,000 | 37 (12.4%) | 178 (59.5%) | 53 (17.7%) | 21 (7.0%) | 9 (3.0%) | 1 (0.3%) | 299 (41.8%) |
| | Low 0 - 7,000 | 6 (9.8%) | 43 (70.5%) | 9 (14.8%) | 3 (4.9%) | 0 (0.0%) | 0 (0.0%) | 61 (8.5%) |
| | Middle 7,001 - 15,000 | 50 (14.0%) | 219 (61.5%) | 59 (16.6%) | 18 (5.1%) | 5 (1.4%) | 5 (1.4%) | 356 (49.7%) |
| Marital status | Divorced | 1 (4.3%) | 8 (34.8%) | 3 (13.0%) | 1 (4.3%) | 0 (0.0%) | 0 (0.0%) | 23 (3.2%) |
| | Married | 0 (0.0%) | 115 (46.9%) | 77 (31.4%) | 12 (4.9%) | 5 (2.0%) | 0 (0.0%) | 245 (34.2%) |
| | Single | 92 (20.6%) | 315 (70.3%) | 36 (8.0%) | 3 (0.6%) | 1 (0.2%) | 1 (0.2%) | 448 (62.6%) |
| Family history of cervical cancer | Don't know | 36 (24.3%) | 328 (62.8%) | 11 (7.4%) | 6 (4.1%) | 2 (1.4%) | 0 (0.0%) | 537 (75.0%) |
| | No | 57 (10.6%) | 103 (19.2%) | 30 (5.8%) | 12 (2.2%) | 6 (1.1%) | 0 (0.0%) | 148 (20.7%) |
# Table 2: Knowledge about HPV and cervical cancer and their associated risk factors

|                                | Yes (0.0%) | 19 (61.3%) | 7 (22.6%) | 5 (16.1%) | 0 (0.0%) | 0 (0.0%) | Total (4.3%) |
|--------------------------------|------------|------------|-----------|-----------|----------|----------|--------------|
| **History of sexually transmitted diseases** |            |            |           |           |          |          |              |
| Don’t know                     | 60 (10.9%) | 335 (61.1%)| 104 (19.0%)| 30 (5.5%) | 13 (2.4%)| 6 (1.1%) | 548 (76.5%) |
| No                             | 33 (20.3%) | 101 (62.0%)| 16 (9.8%) | 12 (7.3%) | 1 (0.6%) | 0 (0.0%) | 163 (22.8%) |
| Yes                            | 0 (0.0%)  | 4 (80.0%)  | 1 (20.0%) | 0 (0.0%)  | 0 (0.0%) | 0 (0.0%) | 5 (0.7%)    |
| **Contraceptive use**           |            |            |           |           |          |          |              |
| Don’t know                     | 7 (0.1%)  | 71 (55.9%)  | 34 (26.8%)| 9 (7.1%)  | 3 (2.4%) | 3 (2.4%) | 127 (17.7%) |
| No                             | 86 (19.6%) | 294 (66.8%)| 41 (9.3%) | 16 (3.6%) | 2 (0.5%) | 1 (0.2%) | 440 (61.5%) |
| Yes                            | 0 (0.0%)  | 75 (50.3%)  | 46 (30.9%)| 17 (11.4%)| 9 (6.0%) | 2 (1.3%) | 149 (20.8%) |
| **Smoking habit**              |            |            |           |           |          |          |              |
| Current smoker                 | 1 (2.7%)  | 26 (70.3%)  | 7 (18.9%) | 2 (5.4%)  | 1 (2.7%) | 0 (0.0%) | 37 (5.2%)   |
| Never smoked                   | 90 (13.7%) | 399 (60.6%)| 110 (16.7%)| 40 (6.1%) | 13 (2.0%)| 6 (0.9%) | 658 (91.9%) |
| Former smoker                  | 2 (9.5%)  | 15 (71.4%)  | 4 (19.0%) | 0 (0.0%)  | 0 (0.0%) | 0 (0.0%) | 21 (2.9%)   |
| **Alcohol drinking**           |            |            |           |           |          |          |              |
| Yes                            | 0 (0.0%)  | 13 (62.0%)  | 4 (19.0%) | 4 (19.0%) | 0 (0.0%) | 0 (0.0%) | 21 (2.9%)   |
| No                             | 93 (13.4%) | 427 (61.4%)| 117 (16.8%)| 38 (5.5%) | 14 (2.0%)| 6 (0.9%) | 695 (97.1%) |
| **Number of lifetime sexual partners** |            |            |           |           |          |          |              |
| None                           | 92 (17.7%)| 355 (68.1%)| 55 (10.6%)| 12 (2.3%) | 5 (1.0%) | 2 (0.4%) | 521 (72.8%) |
| 1 or 2                         | 0 (0.0%)  | 79 (42.9%)  | 63 (34.2%)| 29 (15.7%)| 9 (4.9%) | 4 (2.2%) | 184 (25.7%) |
| 3 or more                      | 1 (9.1%)  | 6 (54.5%)  | 3 (27.3%) | 1 (9.1%)  | 0 (0.0%) | 0 (0.0%) | 11 (1.5%)   |
| Total                          | 93 (12.9%)| 440 (61.5%)| 121 (16.9%)| 42 (5.9%) | 14 (2.0%)| 6 (0.8%) | 716 (100%)  |
|                                | Less than 20 years | 20 - 30 years | 31 - 40 years | 41 - 50 years | 51 - 60 years | More than 60 years | Total | P value | Pearson's r | Pearson's correlation P value |
|--------------------------------|--------------------|---------------|---------------|---------------|---------------|-------------------|-------|---------|-------------|-----------------------------|
| Had ever heard about cervical cancer | Yes                | 47 (8.1%)     | 367 (63.3%)   | 113 (19.5%)   | 39 (6.7%)      | 12 (2.1%)         | 2 (0.3%) | 580     | -0.176      | 0.000                       |
|                                | No                 | 46 (33.8%)    | 73 (53.7%)    | 8 (5.9%)      | 3 (2.2%)       | 2 (1.5%)          | 4 (2.9%) | 136     | (19.0%)     |                             |
| Had ever heard of pap test      | Yes                | 7 (3.1%)      | 133 (58.1%)   | 60 (26.2%)    | 27 (11.8%)     | 2 (0.9%)          | 0 (0.0%) | 229     | -0.190      | 0.000                       |
|                                | No                 | 86 (17.7%)    | 307 (63.0%)   | 61 (12.5%)    | 15 (3.1%)      | 12 (2.5%)         | 6 (1.2%) | 487     | (68.0%)     |                             |
| Cervical cancer can be detected early by screening | Don't know | 56 (19.6%) | 182 (63.9%)   | 33 (11.6%)    | 10 (3.5%)      | 4 (1.4%)          | 0 (0.0%) | 285     | 0.192       | 0.000                       |
|                                | No                 | 0 (0.0%)      | 5 (50.0%)     | 2 (20.0%)     | 3 (30.0%)      | 0 (0.0%)          | 0 (0.0%) | 10      | (1.4%)      |                             |
|                                | Yes                | 37 (8.8%)     | 253 (60.1%)   | 86 (20.4%)    | 29 (6.9%)      | 10 (2.4%)         | 6 (1.4%) | 421     | (58.8%)     |                             |
| The most important risk factor of cervical cancer is alcohol drinking | Yes                | 12 (11.0%)    | 78 (71.6%)    | 13 (11.9%)    | 1 (0.9%)       | 5 (4.6%)          | 0 (0.0%) | 109     | 0.40        | 0.285                       |
|                                | No                 | 81 (13.3%)    | 362 (59.6%)   | 108 (17.8%)   | 41 (6.8%)      | 9 (1.5%)          | 6 (1.0%) | 607     | (84.8%)     |                             |
| The most important risk factor of cervical cancer is having many child birth | Yes                | 4 (7.8%)      | 29 (56.9%)    | 7 (13.7%)     | 6 (11.8%)      | 4 (7.8%)          | 1 (1.0%) | 51      | -0.113      | 0.003                       |
|                                | No                 | 89 (13.4%)    | 411 (61.8%)   | 114 (17.1%)   | 36 (5.4%)      | 10 (1.5%)         | 5 (0.8%) | 665     | (92.9%)     |                             |
| The most important risk factor of cervical cancer is old age | Yes                | 5 (4.2%)      | 74 (62.7%)    | 22 (18.6%)    | 12 (10.2%)     | 4 (3.4%)          | 1 (0.8%) | 118     | -0.118      | 0.002                       |
|                                | No                 | 88 (14.7%)    | 366 (61.2%)   | 99 (16.6%)    | 30 (5.0%)      | 10 (1.7%)         | 5 (0.8%) | 598     | (83.5%)     |                             |
| The most important risk factor of cervical cancer is having many sexual partners | Yes                | 42 (12.5%)    | 222 (66.3%)   | 49 (14.6%)    | 17 (5.1%)      | 3 (0.9%)          | 2 (0.6%) | 335     | 0.08        | 0.032                       |
|                                | No                 | 51 (13.4%)    | 218 (57.2%)   | 72 (18.9%)    | 25 (6.6%)      | 11 (2.9%)         | 4 (1.0%) | 381     | (53.2%)     |                             |
| The most important risk factor of cervical cancer is HPV | Yes                | 25 (8.3%)     | 203 (67.7%)   | 57 (19.0%)    | 12 (4.0%)      | 2 (0.7%)          | 1 (0.3%) | 300     | 0.027       | 0.463                       |
|                                | No                 | 68 (16.3%)    | 237 (57.0%)   | 64 (15.4%)    | 30 (7.2%)      | 12 (2.9%)         | 5 (1.2%) | 416     | (58.1%)     |                             |
| The most important risk factor of cervical cancer is the prolonged use of birth control bills | Yes                | 35 (13.7%)    | 162 (63.3%)   | 33 (12.9%)    | 17 (6.6%)      | 7 (2.7%)          | 2 (0.2%) | 256     | 0.325       | 0.816                       |
|                                | No                 | 58 (12.6%)    | 278 (60.4%)   | 88 (19.1%)    | 25 (5.4%)      | 7 (1.5%)          | 4 (0.9%) | 460     | (64.2%)     |                             |
The most important risk factor of cervical cancer is smoking

|   | Yes | No |   |   |   |   |   |   |   |
|---|-----|----|---|---|---|---|---|---|---|
|   | 11  | 82 | 33 | 333 | 1 | 162 | 0.027 | -0.04 | 0.279 |
|   | (6.8%) | (14.8%) | (20.4%) | (60.1%) | (0.1%) | (22.6%) |

Can HPV infection be transmitted by sexual contact?

|   | Don't know | No | Yes |   |   |   |   |   |   |
|---|-------------|----|-----|---|---|---|---|---|---|
|   | 54  | 9  | 30  | 192 | 48 | 14 | 9 | 1 | 318 |
|   | (17.0%) | (14.3%) | (9.0%) | (60.4%) | (15.1%) | (15.9%) | (15.1%) | (63.3%) | (44.4%) |
|   | (60.4%) | (57.1%) | (63.3%) | (60.1%) | (6.7%) | (6.7%) | (6.7%) | (6.7%) | (6.7%) |
|   | 14  | 5  | 23  | 48 | 10 | 23 | 5 | 2 | 335 |
|   | (4.4%) | (2.8%) | (6.9%) | (15.5%) | (0.0%) | (1.5%) | (1.5%) | (1.5%) | (1.5%) |

The best time to be vaccinated against HPV?

|   | After marriage or at anytime | After sexual contact or childbirth | Before sexual contact |
|---|-------------------------------|-----------------------------------|-----------------------|
|   | 9 (8.2%) | 1 (5.9%) | 29 (13.9%) |
|   | (64.5%) | (23.5%) | (68.8%) |
|   | 71 | 4 | 143 |
|   | (15.5%) | (29.4%) | (11.5%) |
|   | 17 | 5 | 24 |
|   | (6.4%) | (29.4%) | (5.3%) |
|   | 7 | 5 | 11 |
|   | (4.5%) | (11.8%) | (0.5%) |
|   | 5 | 2 | 1 |
|   | (0.9%) | (0.0%) | (0.0%) |
|   | 1 | 0 | 110 |
|   | (15.4%) | (29.1%) | (0.0%) |

Can cervical cancer be preventable by vaccination

|   | Don't know | No | Yes |   |   |   |   |   |   |
|---|-------------|----|-----|---|---|---|---|---|---|
|   | 65  | 17  | 11  | 241 | 37 | 102 | 4 | 0 | 163 |
|   | (16.8%) | (10.2%) | (6.7%) | (62.4%) | (22.2%) | (62.6%) | (1.0%) | (0.0%) | (22.8%) |
|   | 57  | 13  | 19  | 57 | 13 | 27 | 4 | 0 | 167 |
|   | (14.8%) | (22.2%) | (11.7%) | (16.6%) | (7.8%) | (16.6%) | (2.3%) | (0.0%) | (23.3%) |
|   | 10  | 1  | 4  | 10 | 1 | 19 | 4 | 0 | 386 |
|   | (2.6%) | (0.6%) | (2.5%) | (2.6%) | (0.6%) | (11.7%) | (1.0%) | (0.0%) | (53.9%) |

Table 3: Respondents’ attitude and practice towards HPV and cervical cancer.

Table 4: The regression models to predict the sociodemographic effectors on participants’ knowledge, attitude, and practice
| Age group | Less than 20 years | 20 - 30 years | 31 - 40 years | 41 - 50 years | 51 - 60 years | More than 60 years | Total | P value | Pearson's r | Pearson's P value |
|-----------|-------------------|---------------|---------------|---------------|---------------|------------------|-------|---------|-------------|------------------|
| Don't know | 26 (23.2%) | 65 (58.0%) | 17 (15.2%) | 3 (2.7%) | 0 (0.0%) | 1 (0.9%) | 112 | 0.001 | 0.115 | 0.002 |
| No | 13 (15.7%) | 51 (61.4%) | 13 (15.7%) | 1 (1.2%) | 2 (2.1%) | 3 (3.6%) | 83 | 0.001 | 0.115 | 0.002 |
| Yes | 54 (10.4%) | 324 (62.2%) | 91 (17.5%) | 38 (7.3%) | 12 (2.4%) | 2 (0.4%) | 521 | 0.001 | 0.115 | 0.002 |

If you would be offered free cervical cancer screening, would you be willing to be screened?

Don't know

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

Do you plan to be screened for cervical cancer in the next 3 years?

Don't know

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

Had done the HPV vaccination

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

Willingness to be vaccinated and pay

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

Willingness to be vaccinated for free

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

The biggest reason for not having the HPV vaccination is do not trust vaccine safety

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

The biggest reason for not having the HPV vaccination no risk as no sexual exposure

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |

The biggest reason for not having the HPV vaccination is high cost

**Age group**

| Total | P value | Pearson's r | Pearson's P value |
|-------|---------|-------------|-------------------|
|       |         |             |                   |
The biggest reason for not having the HPV vaccination is lack of knowledge about HPV

| Yes | 56 (14.6%) | 241 (62.9%) | 56 (14.6%) | 20 (5.2%) | 8 (2.1%) | 383 (53.5%) |
|-----|------------|-------------|------------|----------|--------|------------|
| No  | 37 (11.1%) | 199 (59.8%) | 65 (19.5%) | 22 (6.6%) | 6 (1.8%) | 333 (46.5%) |

The biggest reason for not having the HPV vaccination is already vaccinated

| Yes | 0 (0.0%) | 3 (75.0%) | 1 (25.0%) | 0 (0.0%) | 0 (0.0%) | 4 (0.6%) |
|-----|----------|-----------|-----------|----------|----------|---------|
| No  | 93 (13.1%) | 437 (61.4%) | 120 (16.9%) | 42 (5.9%) | 6 (1.8%) | 712 (99.4%) |

Are you afraid of screening because of cancer detection?

| Don't know | Yes | No |
|------------|-----|----|-----|
| 21 (16.9%) | 16 (56.3%) | 42 (16.1%) | 3 (2.7%) | 13 (11.6%) | 10 (8.9%) | 420 (15.6%) |

### Model predictors

| R | R Square | Adjusted R Square | Std. Error of the Estimate | Unstandardized Coefficients | t | Sig. |
|---|----------|------------------|---------------------------|-----------------------------|---|-----|
| Knowledge predictors | All predictors | 0.215 | 0.046 | 0.041 | 1.527 | 7.793 | 0.394 | 19.737 | 0.000 |
| Occupation | 0.104 | 0.011 | 0.009 | 1.624 | -0.031 | 0.011 | -2.785 | 0.005 |
| Education level | 0.127 | 0.016 | 0.015 | 1.619 | -0.164 | 0.048 | -3.415 | 0.001 |
| Family income | 0.139 | 0.019 | 0.018 | 1.616 | -0.237 | 0.063 | -3.750 | 0.000 |
| Marital status | 0.089 | 0.008 | 0.006 | 1.626 | -0.261 | 0.109 | -2.375 | 0.018 |
| Attitude | All predictors | 0.151 | 0.023 | 0.017 | 0.417 | 2.144 | 0.103 | 20.813 | 0.000 |
| Occupation | 0.041 | 0.002 | 0.000 | 0.420 | -0.002 | 0.002 | -0.942 | 0.346 |
| Education level | 0.093 | 0.009 | 0.007 | 0.419 | -0.023 | 0.012 | -1.840 | 0.066 |
| Family income | 0.017 | 0.000 | -0.001 | 0.421 | -0.007 | 0.016 | -0.427 | 0.669 |
| Marital status | 0.124 | 0.015 | 0.014 | 0.418 | -0.088 | 0.028 | -3.089 | 0.002 |
| Practice | All predictors | 0.107 | 0.011 | 0.006 | 0.426 | 1.497 | 0.105 | 14.211 | 0.000 |
| Occupation | 0.028 | 0.001 | -0.001 | 0.428 | -0.002 | 0.003 | -0.587 | 0.557 |
| Education level | 0.075 | 0.006 | 0.004 | 0.427 | -0.020 | 0.013 | -1.583 | 0.114 |
| Family income | 0.006 | 0.000 | -0.001 | 0.428 | -0.002 | 0.016 | -0.122 | 0.903 |
| Marital status | 0.083 | 0.007 | 0.006 | 0.426 | -0.059 | 0.029 | -2.000 | 0.046 |

### Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.
• SupplementaryTableS1.docx
• SupplementaryTableS2.docx
• SupplementaryTableS3.docx