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Original Research Article

Impact of Genital Hygiene Awareness on Adolescent Girls in Public Schools, Karachi: Behavioral and Influencing Factors (Quasi-Experimental Study)

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Abstract: *Genital hygiene encompasses a range of personal care practices essential for maintaining the urogenital health of adolescent girls. Inadequate knowledge and improper hygiene behaviors can lead to increased susceptibility to infections, reproductive tract diseases, and compromised reproductive health, particularly in resource-limited settings such as Pakistan.* ***Objective:*** *To determine the impact of awareness on genital hygiene behavior and its associated factors among girls studying in secondary schools in Karachi, Pakistan.* ***Methods:*** *A quasi-experimental pre-post intervention study was conducted at a higher secondary school in Karachi, Pakistan, from July 2024 to February 2025. A purposive sampling technique was employed to recruit participants. Data were collected using a structured, pre-tested questionnaire after obtaining formal permission from school authorities. The intervention included an awareness session on genital hygiene. The collected data were coded, tabulated, and analyzed using SPSS. Socio-demographic characteristics were described, and the Wilcoxon signed-rank test was applied to assess changes in hygiene behaviors before and after the intervention. Statistical significance was considered at $p < 0.05$.* ***Results:*** *Most participants were aged 15–16 (53%). Most fathers had incomplete or completed primary education, whereas mothers were likelier to have attained secondary or higher education. About 56% of the families reported income below their household expenses. Post-intervention results showed a statistically significant improvement in genital hygiene practices, including regular sanitary pads during menstruation, daily bathing, frequent changing of cotton undergarments, and proper drying of the genital area after washing ($p < 0.05$).* ***Conclusion:*** *The findings highlight the critical role of school-based awareness interventions in improving genital hygiene behaviors among adolescent girls. Educational programs tailored to address reproductive health and hygiene can empower young females and enhance their health outcomes..*

Keywords: Genital Hygiene, Menstrual Hygiene, Genital Infections, School age Children, personal hygiene

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Introduction

Genital hygiene is a vast term that includes various hygiene behaviors and care practices necessary to protect the organs in the urogenital region from infectious agents, maintain physical integrity, and improve functional health (1, 2). The genital area is the most humid, warmest, and sensitive body part because menstrual blood, urine, and sweat can accumulate in this area, which may increase the vulnerability of genital infections (3). However, globally, about 1.2 billion adolescents, of whom 85% live in developing countries, were getting knowledge regarding genital hygiene from their family, school, peers, or online resources, but still not following proper practices, leading to reproductive health-related infections (4). Additionally, cultural values and wrong practices including endogenous factors like; poor menstrual hygiene, use of reusable clothes, inadequate hand washing habits after using the bath room, vaginal douching, personal unhygienic practices, keeping the genital area moist, using contaminated towels, and wearing tight non-absorbent underwear, frequency of changing pads and removal of genital hair by razors, whereas, in exogenous factors by frequently using soaps, deodorants, anti-itch creams, and vaginal suppositories may also causing infection and allergy at the perineal area by reducing the acidity of the vaginal microflora. As all these aggravating factors contribute towards GTI and UTI, which are three times more common in women than in men, and later cause infertility in their reproductive life (5, 6). Globally, genital hygiene inadequacies have been highlighted as a serious public health concern, with school children being particularly affected. Every year, approximately 10% of adolescents are globally exposed to genital infections such as urinary tract infections, and more than 70 %of teenagers have a history of a genital infection (7). According to the World Health Organization (WHO), about 80% of the global burden of genital hygiene is concentrated in low- and middle-income countries due to a lack of awareness and inadequate support for managing genital hygiene and menstruation (8, 9). A school-based study in Lalitpur Metropolitan City, Nepal, involving 400 students, highlighted the need for improved genital hygiene knowledge and practices where the respondents were found that only 9.3% had good knowledge, and 25.3% practiced good genital hygiene, besides research also revealed significant associations between genital health issues, poor knowledge, and practices related to genital hygiene as p-value was < 0.05 (10). Moreover, the study of menstrual hygiene practices among 110 adolescent girls in India found that many girls faced challenges in managing their menstruation, including limited access to sanitary products and a lack of education on proper hygiene practices. However, this study also highlighted the need for targeted interventions to address these challenges and promote improved menstrual hygiene practices (11). Furthermore, an analytical study conducted in urban and rural Sindh investigated adolescent girls' knowledge and practices related to hygiene. Herein, the findings indicated that mothers played a crucial role in shaping girls' knowledge and practices. Still, urban girls had better outcomes, with 71% showing good practices, compared to 12% rural girls (12). The significance of this study is that, according to the evidence-based research studies, the dearth of awareness of genital hygiene management among adolescent girls is a major health concern that affects the young girls on multiple levels of health issues. However, inadequate knowledge and practices of genital

hygiene in urban and rural areas directly lead to many diseases like UTI, severe vaginal infection, infertility etc. Hence, this study was conducted to determine the awareness and factors of genital hygiene among adolescent girls in public schools in Karachi, Pakistan.

Methodology

A pre-post quasi-experimental study was conducted in a higher secondary school from July to February 2025; Purposive sampling techniques were used on 400 female students aged between 10 and 19 years, whereas those above 19 years old who did not give consent were excluded from this study. This study was also granted by the Ethical Review Committee (ERC) on behalf of the College of Nursing, Dr. Ruth K.M. Pfau, Civil Hospital Karachi. Informed consent was taken, Anonymity and confidentiality were assured throughout the study, and the data were collected using the adopted Questionnaire, which was granted formal permission through the official correspondence (Abiç, Yatmaz, Altinisik, & Can,2024), with Cronbach's alpha of 0.721, 0.703, and 0.868. The collected data was tabulated and analyzed using the Statistical Package for Social Sciences (SPSS), and the Wilcoxon test was used to analyze the data.

Results

According to socio-demographic data, the majority of participants were aged 16-17 years (52.3%), followed by those aged 14- 15 years (38.8%) and 13- 14 years (7.8%). In terms of educational grade, most participants were from the 8th grade (33.8%), followed by 9th grade (32.8%), 10th grade (19.5%), and 7th grade (14.0%). Most participants identified as Muslim (98.8%), with only 1.3% being non-Muslim. Regarding parental education, 41.0% of fathers had secondary or higher education, 46.0% had incomplete or complete primary education, and 12.0% had no formal education. For mothers, 56.8% had secondary or higher education, followed by 31.8% with incomplete or complete primary education, and 11.5% with no formal education. When examining housing type, 75.3% of families lived in pakka houses, 20.3% lived in half-pakka houses, and 4.3% lived in kacha houses. Regarding household income, 55.3% of families reported earning less than their expenses, 41.0% reported earning equal to their costs, and only 3.3% reported earning more than their expenses. (Table 1)

The pre-test and post-test results indicate significant improvements in knowledge and practices related to genital hygiene among participants. Familiarity with genital organs increased from 27.3% to 87.3% ($p < 0.001$). Understanding the importance of cleanliness rose from 76.8% to 90.8% ($p < 0.001$). Correct practices for washing after defecation and urination improved from 78.0% to 89.8% ($p < 0.001$). Hand washing after defecation and urination showed a significant increase in proper practices, from 7.3% pre-test to 17.0% post-test ($p < 0.001$). Water availability for cleaning remained stable, with no significant change (82.0% pre-test vs. 83.0% post-test; $p = 0.665$). Frequency of bathing improved, with daily bathing increasing from 30.3% to 69.8% ($p < 0.001$). Methods for removing pubic hair also saw improvement, with shaver usage rising from 54.5% to 62.3% ($p < 0.001$). Changing underwear daily increased significantly from 27.5% to 59.0% ($p < 0.001$). The preference for cotton underwear rose from 27.5% to 86.8% ($p < 0.001$). The use of cleansing products improved, with mild soap and water usage increasing from 49.5% to 47.8% ($p < 0.001$). Drying methods for underwear showed a dramatic increase in sun-drying from 44.3% pre-test to 92.3% post-test ($p < 0.001$). For drying the genital area post-bathing, patting dry with a towel increased from 17.0% to 81.8% ($p < 0.001$). (Table 2)

The pre-test and post-test results indicate significant improvements in awareness regarding menstrual hygiene among participants. Familiarity with the concept of menstrual periods increased from 45.3% to 86.5% ($p < 0.001$). The use of menstrual products improved, with those using appropriate products rising from 45.3% pre-test to 63.8% post-test ($p < 0.001$). Cleaning the genital area when changing pads showed a notable increase from 78.0% to 92.3% ($p < 0.001$). Managing personal hygiene during menstruation also improved, with those taking regular showers increasing from 26.3% to 83.5% ($p < 0.001$). Finally, the frequency of changing sanitary pads showed a significant increase, with those changing every 4-6 hours rising from 26.8% to 70.3% ($p < 0.001$). These results demonstrate a substantial enhancement in knowledge and practices related to menstrual hygiene following the intervention. (Table 3)

The awareness of infections affecting the genital tract significantly increased from the pre-test to the post-test. Initially, 20.3% of participants reported being familiar with genital infections, while in the post-test, this figure rose to 77.5%. Those who were unsure decreased from 41.3% to 3.3% ($p < 0.001$). Participants reporting changes in their vaginal discharge also saw a marked improvement. In the pre-test, 18.3% noted experiencing changes, which increased to 52.1% in the post-test. The proportion of participants who had not noticed changes decreased from 45.3% to 22.8% ($p < 0.001$). The experience of discomfort, itching, or burning sensations in the private parts has significantly changed. Pre-test, 16.5% reported these symptoms, while post-test figures rose to 58.8%. Those not experiencing symptoms dropped from 40.0% to 15.3% ($p < 0.001$). The willingness to consult a doctor regarding suspected genital infections improved notably. Initially, only 9.3% had discussed their concerns with a doctor, increasing to 74.8% post-test. The number of participants who felt embarrassed to discuss it also decreased ($p < 0.001$). The use of topical creams or ointments for treating genital infections increased significantly. In the pre-test, 12.5% reported using medication, whereas this increased to 72.3% in the post-test. The proportion of participants who felt they had not needed treatment dropped from 32.6% to 5.5% ($p < 0.001$). (Table 4)

Table 1: Socio-demographic data

Variables	Characteristics	Frequence N	Percentage %
AGE	▪ 11-12	5	(1.3%)
	▪ 13-14	31	(7.8%)
	▪ 14-15	155	(38.8%)
	▪ 16-17	209	(52.3%)
Grade	▪ 7th grade	56	(14.0%)
	▪ 8th grade	135	(33.8%)
	▪ 9th grade	131	(32.8%)
	▪ 10th grade	78	(19.5%)
Religion	▪ Muslim	395	(98.8%)
	▪ Non-Muslim	5	(1.3%)
Father Education	▪ Secondary/Higher Education	164	(41.0%)
	▪ Incomplete/Complete Primary	184	(46.0%)
	▪ No formal education	48	(12.0%)

Mother Education	▪ Secondary/Higher Education ▪ Incomplete/Complete Primary ▪ No formal education	227 127 46	(56.8%) (31.8%) (11.5%)
House Type	▪ Pakka ▪ Half Pakka ▪ Kacha	301 81 17	(75.3%) (20.3%) (4.3%)
Wages/ Income	▪ Less than expenses ▪ Equal to expenses ▪ More than expenses	221 164 13	(55.3%) (41.0%) (3.3%)

Table 2: Genital hygiene

S. No	Variable	Characteristics	Pre-test N(%)	Post-test N(%)	P-value
1	Are familiar with the genital organs	o Yes, I am familiar. o No, I am not familiar. o Somewhat, I know the basics. o I have heard of them, but I am unsure I understand.	109(27.3%) 252(63.0%) 10(2.5%) 29(7.3%)	349(87.3%) 32(8.0%) 16(4.0%) 3(0.8%)	<0.001
2	Do you know why keeping your area clean is crucial?	o Yes, I know proper cleaning is essential for hygiene. o No, I do not know o Somewhat, I know it is important. o Other.	271(76.8%%) 61(15.3%) 65(16.3% 3(0.8%)	363(90.8%) 30(7.5%) 7(1.8%) 0(0.0%)	<0.001
3	POST: Which ways to use when you wash your genital organs after defecation and urination?	o From front to back. o From back to front. o Only front. o Only back.	312(78.0%) 62(15.5%) 19(4.8%) 7(1.8%)	359(89.8%) 31(7.8%) 10(2.5%) 0(0.0%)	<0.001
4	Do you wash your hands	o Before defecation and urination. o After defecation and urination. o Before and after defecation and urination. o None of these.	29(7.3%) 309(77.3%) 59(14.8%) 3(0.8%)	68(17.0%) 118(29.5%) 213(53.3%) 1(0.3)	<0.001
5	Do you have enough water to clean the genital area?	o I always have enough water to clean. o I sometimes have enough water to clean. o I often do not have water to clean. o I mostly do not have enough water to clean	328(82.0%) 58(14.5%) 11(2.8%) 3(0.8%)	332(83.0%) 54(13.5%) 14(3.5%) 0(0.0%)	0.665
6	How often do you bathe?	o I bathe daily. o I bathe 2-3 times a week. o I bathe 1-2 times a week. o I bathe less than once a week.	121(30.3%) 236(59.0%) 40(10.0%) 3(0.8%)	279(69.8%) 105(26.3%) 14(3.5%) 2(0.5%)	<0.001
7	What method do you use to remove your pubic hair?	o Shaver. o Waxing. o Threading. o Reusable Razors	218(54.5%) 109(27.3%) 18(4.5%) 55(13.8%)	249(62.3%) 103(25.8%) 14(3.5%) 34(8.5%)	<0.001
8	How many times do you change your underwear?	o Daily. o Every other day. o 2-3 times a week. o When I feel uncomfortable or notice an odor.	110(27.5%) 108(27.0%) 82(20.5%) 100(25.0%)	235(59.0%) 94(23.5%) 51(12%) 20(5.0%)	<0.001
9	What type of underwear fabric are you using?	o Cotton. o Nylon. o Jersey. o Silk.	110(27.5%) 85(21.3%) 1445(36.3%) 60(15.0%)	346(86.8%) 20(5%) 21(5.3%) 3(0.8%)	<0.001
10	Which genital cleansing products are used during the cleaning of the genital area?	o Only Water. o Mild soap and water. o Vaginal wash (Antibacterial /Antifungal cleanser) o None of these.	161(40.5%) 198(49.5%) 28(7.0%) 13(3.3%)	178(44.5%) 191(47.8%) 27(6.8%) 4(1.0%)	<0.001
11	Do you dry your underwear?	o Dry in sunlight. o Hang to dry. o Dryer. o None of these.	177(44.3%) 141(35.3%) 51(12.8%) 31(7.8%)	369(92.3%) 27(6.8%) 4(1.0%) 0(0.0%)	<0.001
12	How do you dry your genital area after bathing?	o Gently pat dry with a towel. o Let it dry naturally. o Use a clean.	68(17.0%) 289(72.3%) 22(5.5%)	327(81.8%) 54(13.5%) 17(4.3%)	<0.001

		○ None of these	21(5.3%)	2(0.5%)	

Table 3: Awareness about menstrual periods:

S. No	Variables	Characteristics	Pre-test N (%)	Post-test N (%)	P-value
1	Are you familiar with the concept of menstrual periods?	○ Yes, I am very familiar with menstrual periods. ○ I have a general understanding. ○ I know the basics. ○ No, I am not familiar	181(45.3%) 94(23.5%) 90(22.5%) 35(8.8%)	346(86.5%) 38(9.5%) 12(3.0%) 4(1.0%)	<0.001
2	Which type of products do you use during your periods?	○ Pads. ○ Reusable cloth pads. ○ Combination of both (pads and cloth). ○ Other	181(45.3%) 94(23.5%) 90(22.5%) 35(8.8%)	255(63.8%) 44(11.0%) 92(23.0%) 9(2.3%)	<0.001
3	Do you clean your genital area when changing pads?	○ I always wash. ○ Sometimes, I clean. ○ Rarely, I do not usually clean. ○ I don't wash.	312(78.0%) 45(11.3%) 17(4.3%) 26(6.5%)	369(92.3%) 22(5.5%) 7(1.8%) 2(0.5%)	<0.001
4	How do you manage personal hygiene during menstruation?	○ I take a shower as usual. ○ I take a shower but less frequently. ○ I use wet wipes. ○ I follow specific cultural or religious practices	105(26.3%) 195(48.8%) 30(7.5%) 70(17.5%)	334(83.5%) 50(12.5%) 12(3.0%) 4(1.0%)	<0.001
5	How often do you change your sanitary pads?	○ Every 4-6 hours. ○ Every 2-3 hours ○ As needed (uncomfortable). ○ Morning and Night only.	107(26.8%) 61(15.3%) 143(35.8%) 89(22.%)	281(70.3%) 94(23.5%) 10(2.5%) 15(3.8%)	<0.001

Table No. 4: awareness of unusual findings

S.No	Variable	Characteristics	Pre-test N (%)	Post-test N (%)	P-value
1	Have you heard about infections that can affect the genital tract?	○ Yes, I'm familiar with the genital infections. ○ I've heard of some, but I'm unsure about the details. ○ I know a little. ○ No, I'm not sure what genital infections are.	81(20.3%) 101(25.3%) 53(13.3%) 165(41.3%)	310(77.5%) 47(11.8%) 30(7.5%) 13(3.3%)	<0.001
2	Have you noticed any odd colors or odors in your vaginal discharge?	○ Yes, I have experienced changes. ○ Sometimes, I notice changes. ○ No, I haven't noticed. ○ Other	73(18.3%) 95(23.8%) 181(45.3%) 51(12.8%)	208(52.1%) 89(22.3%) 91(22.8%) 12(3.0%)	<0.001
3	Have you experienced discomfort, itching, or burning sensations in your private parts?	○ Yes, I experience these symptoms. ○ Occasionally, I feel some discomfort or itching. ○ No, I don't experience these symptoms. ○ None of these.	66(16.5%) 132(33.0%) 160(40.0%) 42(10.5%)	235(58.8% 94(23.5%) 61(15.3%) 10(2.5%)	<0.001
4	Do you consult your doctor if you suspect a genital infection?	○ Yes, I've discussed. ○ I'm embarrassed to talk about. ○ No, I haven't needed. ○ None of these	37(9.3%) 80(20.0%) 226(56.5%) 57(14.3%)	299(74.8% 47(11.8%) 41(10.3%) 13(3.3%)	<0.001
5	Do you use topical creams or ointments to treat genital infections?	○ Yes, I've taken medication. ○ I've used over-the-counter or home remedies. ○ No, I haven't needed. ○ None of these.	50(12.5%) 43(10.8%) 178(44.5%) 129(32.6%)	289(72.3%) 43(10.8%) 46(11.5%) 22(5.5%)	<0.001

Discussion

The study demonstrated significant improvements in genital hygiene (27.3% to 87.3%, $p < 0.001$), menstrual hygiene (45.3% to 63.8%, $p < 0.001$), and genital tract infection awareness (20.3% to 77.5%, $p < 0.001$) among adolescent girls after the intervention. Similarly, a study in India found a (35%) increase in menstrual hygiene knowledge (13). At the same time, our study showed a (51.5%) increase in genital hygiene knowledge among them. Moreover, a Nigerian study reported a (25%) increase in sanitary pad use (14). At the same time, our study found a (43.5%) increase in the use of appropriate menstrual products. The findings and results from the study highlight significant variations in genital hygiene knowledge and practices among participants. While most individuals knew the importance of proper cleaning and hygiene, a notable portion lacked a detailed understanding of anatomy and effective practices. For example, although many practiced correct cleaning methods (front to back) and

daily bathing, others used incorrect techniques or bathed less frequently. The study depicts that anatomical hygiene is vital, as it decreases the risk of infections. These findings were supported by a study that emphasized creating awareness of genital education and understanding (15). Hand washing was common after using the toilet, but less frequent before, indicating the need for better hygiene education. This causes UTIs and other related issues, as observed by the present study, and is supported by previous research (16). Similarly, gently patting the factor was observed in the study to ensure that the genital area is dry after bathing, which is a hygienic practice. However, the study shows that participants relied on natural drying, which may leave moisture, increasing the risk of infections. A study by Yaliwal et al. revealed that promoting pat drying with a clean towel could improve hygiene (17).

According to current results, most participants had access to water and preferred cotton underwear, which are positive factors for maintaining hygiene. However, inconsistent practices like infrequent underwear changes and improper drying methods lead to infections. A study underscored similar results, stating that using cotton under garments and daily changing underwear is necessary to prevent fungal disease and bacteria (18).

In addition, regular bathing is crucial to maintaining hygiene. In the study, the people are less aware of cleaning pubic hair, though it is very necessary, and most people use blades, which is very dangerous, as it might lead to cuts and infections. A similar study showed that people are well aware of frequent hand washing, but (59.0%) don't bathe daily, especially during menstruation. It is perfectly fine to wash daily, and it is suggested that the waxing technique be used to clean the genital area without any infection being caught (19).

Menstruation represents a critical milestone in the pubertal development of adolescent females. It is characterized by a cyclical process of physiological growth and maturation that plays a pivotal role in the reproductive health of young girls. This natural process holds immense significance in a girl's reproductive well-being. Therefore, providing comprehensive health education on menstrual hygiene is essential to enable adolescent girls to effectively manage menstruation and maintain proper hygiene practices (20).

The present study found that the average age of participants was 12.75±15 years. This finding is aligned with studies where most participants were between 13 and 16 years (21, 22). Initially, the study revealed that adolescent girls had a low level of awareness about menstruation and menstrual hygiene before the implementation of the menstrual health education program. However, the intervention led to substantial improvements in knowledge and practices, as demonstrated by the pre-test and post-test results. These findings are consistent with the conclusions that emphasized that acquiring the right knowledge and attitudes about menstruation is vital for establishing desirable health behaviors that contribute to protecting and developing overall health (23). The present study's results further underline the awareness program's positive impact. After the intervention, they highlight a significant enhancement in knowledge and practices related to menstrual hygiene. The findings underscore that hygienic practices, such as using sanitary pads and adequately washing the genital area during menstruation, are essential for maintaining health. These practices are also crucial for preventing infections. Similarly, earlier studies have drawn conclusions, which emphasize the importance of proper hygiene, the use of sanitary pads or tampons, and the cleaning of genital areas as essential measures to keep adolescent girls healthy and protect them from infectious diseases (24). In this study, adolescent girls demonstrated more positive changes in their knowledge of genital hygiene practices after the intervention compared to their pre-test scores. These findings are supported by a meta-analysis that also highlighted the effectiveness of health education in improving hygiene knowledge among adolescents (25). Moreover, the current study demonstrated a significant increase in awareness and proactive management of genital tract infections. This is consistent with findings from a cross-sectional study, which emphasized the importance of training and educational programs in helping girls understand their bodies and behaviors (26). The study results further emphasized that awareness of genital hygiene and vaginal health is crucial for the early detection and timely management of infections among adolescent girls. A noticeable decline was observed in participants who were unaware of changes or symptoms, which reflects a shift toward more vigilant health monitoring. Similar observations were made in research by Zakaria et al. (2023), which stressed that insufficient genital hygiene is a leading cause of infections and that raising awareness is vital to prevent such issues (27). Another noteworthy finding of the present study is the increased willingness of participants to seek medical advice for suspected genital health concerns. A significant rise in the proportion of girls consulting doctors and a reduction in feelings of embarrassment to discuss such issues highlight the intervention's success in fostering an open and supportive environment. This is particularly important in cultures where discussing reproductive health is often stigmatized. Another study also highlighted the importance of providing awareness and creating a safe space for adolescent girls to discuss reproductive health concerns without fear of judgment (28). The study additionally underscores the importance of providing not only theoretical knowledge but also practical solutions and access to essential resources.

Adolescent girls, as highlighted by Yilmaz and Kahraman (2019), who represented a unique group with distinct health needs. They frequently encounter reproductive health challenges but are often the least likely to benefit from available health services (29). Raising awareness about proper hygiene practices is one of the most critical responsibilities of nurses and healthcare professionals working directly within communities. Overall, the findings of this study demonstrate the critical role of educational interventions in improving awareness and promoting health practices related to genital infections and menstrual hygiene. By addressing cultural barriers, equipping participants with essential information, and improving access to resources, such programs can significantly enhance the health and well-being of adolescent girls, especially in underserved or conservative communities (30). To ensure the sustainability of these positive changes, further initiatives should build upon these results and focus on expanding outreach to broader populations, thereby creating a lasting impact on menstrual and reproductive health awareness.

Conclusion

The study's findings highlight the need for comprehensive and targeted interventions to address the reproductive health needs of adolescent girls. By promoting education and awareness, we can empower young girls to take control of their reproductive health and well-being.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

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Consent for publication

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Author Contribution

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Manuscript drafting, Study Design,
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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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