

BMJ Open Menstrual health and hygiene among young Palestinian female university students in the West Bank: a cross-sectional study

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ABSTRACT

Objective We investigated some aspects of menstrual health and hygiene among young female students at Birzeit University in the West Bank of the occupied Palestinian territory.

Design Cross-sectional study in a large central university. **Participants** Out of a total of 8473 eligible female students, a calculated sample size of 400 students aged between 16 and 27 years was obtained.

Setting

Large central university, West Bank, occupied Palestinian territory (oPt).

Measures An anonymous structured international research instrument consisting of 39 questions based on the Menstrual Health Questionnaire, in addition to few questions relevant to the context, was administered.

Results 30.5% of participants were not informed about menstruation before menarche, and 65.3% reported that they were not ready when they got their first period. The highest reported source of information regarding menstruation was family (74.1%), followed by school (69.3%). About 66% of respondents reported that they need more information on various topics of menstruation. The most common type of menstrual hygiene products used were single-use pads (86%), followed by toilet paper (13%), nappies (10%) and reusable cloths (6%). Of the total 400 students, 14.5% reported that menstrual hygiene products are expensive, and 15.3% reported that they always/sometimes had to use menstrual products that they do not like because they are cheaper. Most (71.9%) of the respondents reported that they used menstrual products for longer time than recommended due to inadequate washing facilities at the university campus.

Conclusions The findings provide useful evidence on the lack and the need for menstrual-related information for female university students, inadequate infrastructure to help them manage their menstruation with dignity and pointed to some menstrual poverty in accessing menstrual products. A national intervention programme is needed to increase awareness regarding menstrual health and hygiene among women in local communities and female teachers in schools and universities to enable them to disseminate information to and meet the practical needs of girls at home, at school and at the university.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study fills the gap in the literature regarding menstrual health and hygiene in low/middle-income countries, particularly the Eastern Mediterranean region and Palestine.
- ⇒ We used an international research tool that researchers from other countries used to allow for international comparisons.
- ⇒ The study participants were representative of the female university student population from which the sample was calculated.
- ⇒ Data were collected face-to-face among students in one large Palestinian university whose students come from different parts of the West Bank of Palestine.

INTRODUCTION

Menstruation is a healthy sign and a physiological natural cyclic event, occurring every 21–35 days, lasting between 2 and 7 days and causes bleeding of about 25–80 mL per menstruation.^{1 2} Despite being a central monthly event in women's and girls' lives when they have to deal with many practical issues related to this event every month, roughly from ages 12 until 50 years, menstrual health has been a neglected issue in the global agenda. Recent global calls advocated for menstrual health and hygiene as a public health issue and basic right to reach Sustainable Developmental Goals (SDGs) by 2030.^{3–6} According to Hennegan *et al*, 'Menstrual health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity, in relation to the menstrual cycle'.⁷

Advocacy for empowering women and girls to safely access resources and manage their menstrual cycle each month, in privacy and with dignity, is crucial for their physical and psychosocial health, and engagement and participation in the development of

their communities. This is especially true for women and girls in low/middle-income countries (LMICs) and areas of conflict and displacement.^{8,9} Unfortunately, the evidence from many countries indicated that millions of women and girls are struggling to manage their monthly menstrual cycle due to shame, stigma, stress, social exclusion, inadequate information and support and lack of access to menstrual products, and water, sanitation and hygiene (WASH) facilities in schools, universities and the workplace.^{9–21} Menstrual poverty refers to a lack of access to needed menstrual products or necessary sanitation facilities²² or adequately and timely information²³ during menstrual period, which is a crucial part of reproductive health and is a basic human right.⁶ A mapping study that included 81 studies from LMICs found that girls were unprepared and lacked information before menarche, primary sources of information were their mothers and family members, teachers were not adequately prepared to respond to needs of girls, and feelings of shame, exclusion and misconceptions affected girls' hygienic practices and health-seeking behaviours and resulted in missing school.¹⁵ Many previous studies from various countries, mainly sub-Saharan African countries, assessed menstrual hygiene practices, knowledge, experiences, feelings and attitudes about menstruation, but only a few from the Middle East and North Africa (MENA) region,¹⁰ including the occupied Palestinian territory (oPt).

The neglect of menstrual health and hygiene is evident in countries with ongoing protracted conflicts such as oPt, where health services are inadequate and fragile because of residential attacks at night, bombardments, displacement and other barriers to accessing healthcare. The oPt is an LMIC with an ongoing and protracted conflict for more than 70 years. Women who live under humanitarian crisis and/or emergencies face various barriers to access sanitary pads, menstrual products and disposal mechanism, inadequate availability of WASH facilities, could not afford soap to wash hands and face difficulties using menstrual hygiene kits that were distributed without instructions.²⁴ The Palestinian population has been continuously described as 'young'. According to the United Nations, adolescence is defined as those within the age range 10–19 years and youth is defined as those within the age range 15–24 years, regardless of marital or economic status.²⁵ In the Palestinian context, the Palestinian Central Bureau of Statistics defines the age group of 18–29 years as youth.²⁶ According to the recent Palestinian Multiple Indicator Cluster Survey (MICS) results, young women and men aged 15–29 years constitute about one-third (28.9%) of the Palestinian population, of which 36.1% are females aged 15–19 years and 63.9% aged 20–29 years.²⁷ Education is a main investment for Palestinians. Despite the challenging living conditions, Palestinian families prioritise education for their children. The illiteracy rate in oPt is 2.3% among the population aged 15 years and above, which is considered one of the lowest rates in the world.²⁸ In 2020, female graduates from

universities constituted a double rate than that for male graduates (25 909 (63%) vs 15 228 (37%), respectively).²⁹

Research focused on youth is scarce in Palestine and mainly in a form of reports by local organisations concentrated on general issues such as unemployment, empowerment and participation,³⁰ or for purpose of planning local programmes.^{31,32} While these reports guide planning and implementing programmes and actions to meet the needs of youth, they provide no evidence since they are mostly based on reviewing previous reports and literature. Limited evidence is available on youth health. Few studies focused on risky behaviours such as smoking^{33–36} and gender and domestic violence.³⁷ Reproductive health services for girls and women are usually focused on married women,³⁸ and less attention has been given to menstrual health as part of sexual and reproductive health (SRH).³⁹

Similar to the rest of the world, evidence on menstrual health and hygiene for young females living in the oPt remains very scarce. In addition to the MICS follow-up limited indicators related to menstrual health and hygiene as part of the SDG monitor,²⁷ there are only two studies available on menstrual health from Palestine, which focused only on dysmenorrhoea.^{40,41} Moreover, the evidence on menstrual health from the MENA region is also very limited.^{42–46}

In the latest MICS (2019–2020), out of 6425 women and girls aged 15–49 years who reported menstruating in the last 12 months, almost 79% were using appropriate menstrual hygiene materials with a private place to wash and change while at home and 96.8% of women using appropriate materials for menstrual management during the last menstruation. Additionally, about 14.8% out of 168 girls aged 15–19 years and 13.9% out of 989 young women aged 20–24 years reported they did not participate in social activities, school or work due to their last menstruation in the previous 12 months.²⁷

Young people face many challenges all around the world. Like most countries in the MENA region, young Palestinian people are often left without suitable sources of SRH information and education throughout the health systems. The school curricula include basic information regarding menstruation, yet many school teachers skip or leave it out or feel hesitant to discuss it in the classroom due to embarrassment, ignorance or fear of the community's reaction.³⁰ Mothers often tend to discuss issues related to menstruation from the angle of hygiene as recommended by Islamic religion (purity: 'Tahara'). This leaves female youth with little or no information from school and family channels, and rely on external sources such as friends or social media.³⁰ The inadequate access to information for young Palestinian women is exacerbated by an unstable political situation due to several bombardments and siege on Gaza, and continuous invasions of Palestinian residential areas in the West Bank, displacement of women and their families seeking for protection, absence of national policies and targeted interventions to meet their needs, financial difficulties and low employment

opportunities are all challenges negatively influencing their health and well-being. Thus, in this study, we aim to investigate the status of menstrual health and hygiene among young female students at Birzeit University (BZU) in the West Bank of the oPt. The study will inform future policy, practice and research.

METHODS

Study design, research tool and setting

This is a quantitative, descriptive, cross-sectional study conducted among female students studying at BZU, West Bank, oPt. Data were collected face-to-face between April and May 2022 by trained field workers.

Participants and sample size

All female university students were eligible. A simple random sample size calculation formula for finite population, where the total population was 8473 female students, with 95% confidence level, was used. The calculated sample size was 367 and we collected 400 cases to account for the design effect. Participants were recruited by the research team to fill in the questionnaire on campus during all weekdays except Friday and Sunday. Data collection was completed in 2 weeks by using a self-administered questionnaire. Research team members were present around participants for any queries.

Instrument

We used a structured research instrument consisted of 39 questions mainly based on the Menstrual Health Questionnaire.²¹ The research tool was translated to Arabic language and translation was revised by the research team. The research tool was piloted among eight university students who were not included in the study to ensure clarity and correct any ambiguous or inconsistent terminology. The research team adapted some changes in some questions to suit the local context or as learnt from the pilot group, such as exclusion or modification of some questions, to make the tool relevant to the context.

Statistical analysis

Data were entered into SPSS V.25. Descriptive statistics were performed for each variable. Age was categorised and analysed as mean (SD). Categorical variables were described as percentages.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Students and menstrual characteristics

In this cross-sectional survey, 400 female students participated in the study. Age ranged between 16 and 27 years old with a mean of 20 ± 1.3 . Age at menarche (the first menstrual period) ranged between 10 and 18 years

old with a mean of 13.7 ± 1.5 . The prevalence of irregular menstrual cycles was 12.5%. Eighty-five per cent of participants were afraid of blood leakage through their clothes, a proxy for the heaviness of bleeding. Menstrual pain was highly prevalent; 98.3% of the participating girls reported menstrual pain at some time, while 45.8% indicated that they always suffer from menstrual pain. Participating girls reported a list of symptoms they suffered during menstruation, a mix of positive and negative feelings. The negative feelings included being tired (78.0%), sensitive (64.0%), angry (55.3%), sad (45.3%), dirty (24.1%) and embarrassed (8.8%). To a lower extent, some girls reported being happy (12.8%) and relaxed (4.5%). The girls were also asked if they had suffered from any symptoms of reproductive system problems/disorders during the past 6 months. The most common reported symptoms were unusual vaginal discharge (22.8%), then came genital redness or inflammation (14.5%), while 13.0% reported having vaginal irritation, and the same proportion reported having genital rash. The menstrual characteristics of participants are presented in [table 1](#).

Menstrual information and knowledge

Out of the total, about one-third (30.5%) of participants did not know about menstruation before menarche, and the majority (65.3%) reported that they were not ready when they got their first period and 10% said they did not know if they were ready or not. The highest reported source of information regarding menstruation was family (74.1%), followed by school (69.3%), then friends (22.6%). Internet, social networks, university, magazines/books and TV were also reported as sources of menstrual information ([figure 1](#)).

General knowledge regarding menstruation seems to be inadequate among female university students. Menstruation is blood that comes out of vagina was correctly answered by almost 81.8%, while 53.0% agreed that people menstruate every 3 weeks. A small percentage of participants agreed that the duration of menstruation for 10 days or more is common (1.3%) and women menstruate all their lives (2.0%). This reflects inadequate/suboptimal knowledge regarding menstruation. Around two-thirds (66.0%) of our respondents reported that they needed more information on menstruation on different topics: menstrual delays (59.8%), the impact of menstruation on daily life (46.2%), menstrual products (28.4%), menstrual duration (9.8%) and menstruation in general (13.3%). Regarding the acceptability of the participants to access information at the health centre/clinic or pharmacy, 55.0% reported they never tried but would like to, while 20.6% reported that they never tried and they did not want to. Almost half (41.8% and 50.1%) of participants think that pain is always and sometimes normal during menstruation, respectively. Menstrual information and the need for information of BZU students are presented in [table 2](#).

Table 1 Menstrual characteristics of female students at Birzeit University (N=400)

| | N | % |
|---|-----|------|
| Is your menstrual cycle regular? N=400 | | |
| The same every month | 126 | 31.5 |
| Varies each month slightly | 224 | 56.0 |
| Never the same each month | 50 | 12.5 |
| Scared of staining clothes with blood when menstruating? N=394* | 336 | 85.3 |
| Do you suffer from menstrual pain? N=400 | | |
| Always | 183 | 45.8 |
| Sometimes | 176 | 44.0 |
| Very few times | 34 | 8.5 |
| Never | 7 | 1.8 |
| How do you feel during menstruation? | | |
| Tired (N=400) | 312 | 78.0 |
| Sensitive (N=400) | 256 | 64.0 |
| Angry (N=400) | 221 | 55.3 |
| Sad (N=400) | 181 | 45.3 |
| Dirty (N=398)* | 96 | 24.1 |
| Embarrassed (N=400) | 35 | 8.8 |
| Happy (N=400) | 51 | 12.8 |
| Relaxed (N=400) | 18 | 4.5 |
| In the last 6 months, did you suffer from any of the following? | | |
| Genital rash (N=398)* | 53 | 13.3 |
| Vaginal irritation (N=399)* | 52 | 13.0 |
| Genital redness or inflammation (N=399)* | 58 | 14.5 |
| Unusual vaginal discharge (colour/odour) (N=399)* | 91 | 22.8 |

N=total number of participants responding to a question (the denominator).

*Totals are less than 400 because of missing data.

Use of and access to menstrual hygiene products

The most common type of menstrual hygiene products used was a single-use pad (86.5%), followed by toilet paper (12.5%), nappies (10.0%) and reusable cloths (6.0%). The remaining 4.5% reported using different things including tampons, menstrual sponge or menstrual underwear. The distribution of types of menstrual hygiene

products reported to be used by female students at BZU is presented in [figure 2](#).

Access to menstrual hygiene products and supplies for students was reported in terms of cost, source and others including patterns of use, availability of facilities and embarrassment when buying these products (see [table 2](#)). The majority of the students (70.8%) reported that

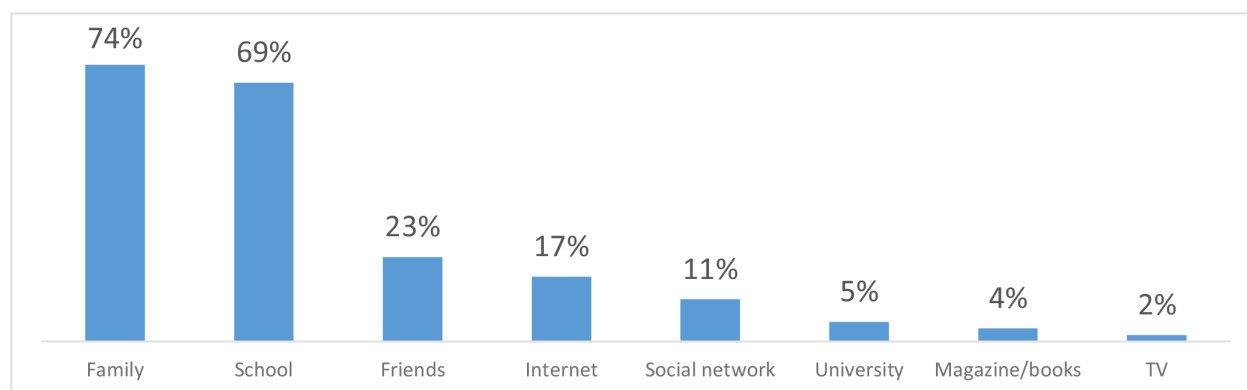


Figure 1 Sources of menstrual information reported by female students at Birzeit University (N=400). The total adds for more than 100 because this was a multiple-response question.

Table 2 Menstrual information and education among female students at Birzeit University (N=400)

| | N | % |
|--|-----|------|
| Did you know about menstruation before its first onset? N=387* | | |
| Yes | 269 | 69.5 |
| No | 118 | 30.5 |
| When you got your first period, did you feel ready for it? N=400 | | |
| Yes | 97 | 24.3 |
| No | 261 | 65.3 |
| I do not know | 42 | 10.5 |
| Do you need more information on menstruation? N=400 | | |
| No, I have enough information/not interested | 136 | 34.0 |
| Yes | 264 | 66.0 |
| <i>Menstrual delays</i> † | 158 | 59.8 |
| <i>Impact of menstruation on daily life</i> † | 122 | 46.2 |
| <i>Menstrual products</i> † | 75 | 28.4 |
| <i>What is menstruation?</i> † | 35 | 13.3 |
| <i>Menstruation duration</i> † | 26 | 9.8 |
| Have you ever asked about menstruation in your health centre, clinic or pharmacy? N=398* | | |
| Yes | 69 | 17.3 |
| No, but I would like to | 219 | 55.0 |
| No, and I do not want to | 82 | 20.6 |
| I do not know | 28 | 7.0 |
| Do you feel embarrassed talking about menstruation? N=396* | | |
| Yes | 25 | 6.3 |
| Sometimes | 151 | 38.1 |
| No | 220 | 55.6 |
| How often have you made up an excuse not to say that you were menstruating? N=387* | | |
| Always | 55 | 14.2 |
| Sometimes | 167 | 43.2 |
| Never/very few times | 165 | 42.6 |
| Based on your knowledge, what is true about menstruation?‡ N=400 for each choice | | |
| Menstruation is blood that comes out of the vagina | 327 | 81.8 |
| People menstruate every 3 weeks | 212 | 53.0 |
| It is common to menstruate over 10 days or more | 5 | 1.3 |
| Women menstruate all their lives | 8 | 2.0 |
| I do not know | 5 | 1.3 |
| Do you think menstrual pain is normal? N=395* N=560 | | |
| Yes, it always hurts | 165 | 41.8 |
| It hurts sometimes | 198 | 50.1 |
| It shouldn't hurt too much | 32 | 8.1 |

*Totals are less than 400 because of missing data.

†Percentages out of those who said yes (N=264).

‡The total adds up to more than 100 because this was a multiple-response question.

they cannot get free menstrual hygiene products at the university. Of the total 400 students, 14.5% reported that menstrual hygiene products are expensive, while 15.3% did not care about the cost. Responding to the question

regarding the lack of money to buy menstrual hygiene products, 77.4% answered 'never/few times', and almost one-fourth of their responses implied that they lacked the money: 3.3% answered always, 12% sometimes and

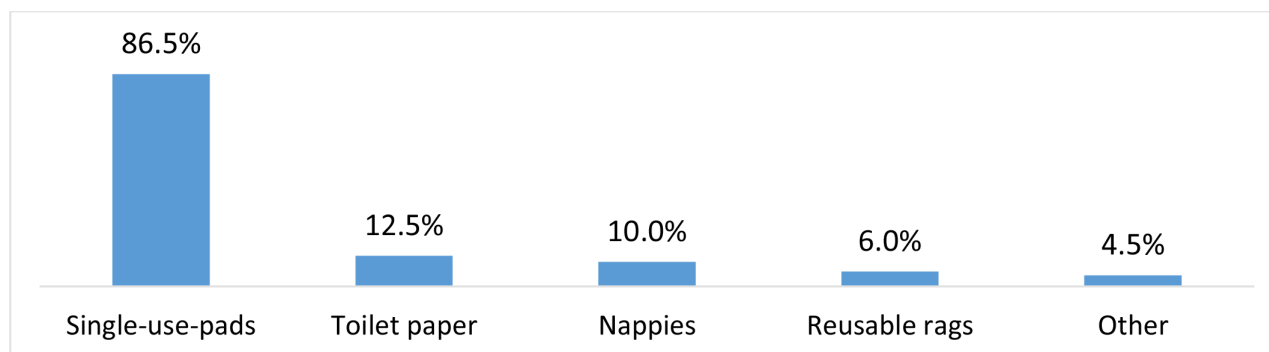


Figure 2 Types of menstrual hygiene products reported to be used by female students at Birzeit University (N=400). The total adds up to more than 100 because this was a multiple-response question. Other includes: tampons, menstrual cups and menstrual underwear.

7.3% 'I do not know'. Furthermore, 16.3% reported that they had to use menstrual products that they do not like because they are cheaper: always 3.3%, sometimes 12% and 'I do not know' 4%. The majority of the students (84.3%) reported that while at the university, they get their menstrual products from home. The pharmacy was reported to be the most comfortable place to buy menstrual products (50.5%), while 27.5% reported that it is comfortable to get menstrual products from the supermarket. More than one-third (38.5%) reported that getting menstrual products is not comfortable at all. Embarrassment to buy menstrual products was also reported by more than half (55.4%) of the students: always 10.8%, sometimes 29.5% and someone else buy them 15.1%. There were challenges reported by female students regarding the available facilities at the university to facilitate hygiene practices. Most (71.9%) of the respondents reported that they used menstrual products for a longer time than recommended because they could not find appropriate washing facilities (always 13.8%, sometimes 40.3% and few times 17.8%). Furthermore, 16.1% reported that they used menstrual products for longer time than recommended because the students do not have a replacement, and 8.0% responded 'I do not know' (table 3).

DISCUSSION

This study shed light on menstrual health and hygiene status among female students at BZU, and provided some understanding of the main challenges these students face with their menstruation. Our findings pointed to inadequate preparation and limited information of female students before menarche, a knowledge gap that persisted with them where they currently demanded more information. The main sources of information were their families and schools. Furthermore, the study reflected on the inadequacy of WASH facilities at the campus and the presence of menstrual poverty among female university students at BZU. Menstrual pain was highly prevalent among our participants, and some of them suffered from some reproductive system symptoms during the past 6 months.

The participants reported a list of negative feelings and lower rates of few positive feelings towards menstruation.

In this study, the mean age of menarche was 13.7 ± 1.5 . This conforms to the age of menarche reported from a study among university students in Saudi Arabia (13 ± 1.7)⁴⁷ and Ghana (13.7 ± 1.9).⁴⁸ Adequate knowledge before menarche is a crucial issue and influences hygiene practices during menstruation,⁴⁸ and is associated with positive feelings, experiences and confidence in menstruation management.^{20 49} In our study, around one-third reported having no information before menarche, while around two-thirds reported not being prepared, indicating that information by itself is not enough for the preparation process. Different aspects need to be taken into consideration when preparing girls for menstruation including the timing and type of information and support being provided: physical, practical, psychological and emotional. This is in line with findings from a recent study on menstrual preparedness among adolescent Palestinian female refugees in the West Bank and Jordan²³ and LMIC mapping study among schoolgirls, which reported a range of girls with information before menarche from 12.1% in India to 100% in Turkey.¹⁵ Our results contrast findings from a study among university students in Ghana where 73.4% were aware of menstruation before menarche.⁴⁸ This difference between Palestine and Ghana could be related to variations among the two cultures, Eastern Mediterranean and African, and how families deal with such sensitive issues. Discussing menstrual issues before menarche seems to be not an easy task among Palestinian families. Higher rates of inadequate knowledge of menstruation before menarche among adolescent schoolgirls were reported from Bangladesh (64%)⁵⁰ and Ethiopia (68.3%),⁵¹ and among female university students in Saudi Arabia (73.4%).⁴⁷ In a secondary analysis of four studies assessing awareness of menstruation before menarche among 2317 schoolgirls from Myanmar, Bangladesh and Uganda, and 599 adult women from Uganda, awareness was the lowest in Bangladesh (34%) and highest in Myanmar (84%).⁴⁹ Lack of menstrual knowledge among university students

Table 3 Access to menstrual hygiene products and supplies for female students at Birzeit University (N=400)

| | | | N | % |
|--------|--|------------------------------|-----|--------|
| Cost | Do you think menstrual products are expensive? N=400 | Yes | 58 | 14.5 |
| | | No | 281 | 70.3 |
| | | I do not care | 61 | 15.3 |
| | Have you ever lacked any money to buy menstrual products? N=399* | Always | 13 | 3.3 |
| | | Sometimes | 48 | 12.0 |
| | | Never/few times | 309 | 77.4 |
| | | I do not know | 29 | 7.3 |
| | Have you ever had to use menstrual products that you do not like because the ones you like are too expensive? N=400 | Always | 8 | 2.0 |
| | | Sometimes | 41 | 10.3 |
| | | Never/few times | 335 | 83.8 |
| | | I do not know | 16 | 4.0 |
| Source | Can you get free menstrual products in the university? N=397* | Yes | 26 | 6.5 |
| | | No | 281 | 70.8 |
| | | I do not know | 90 | 22.7 |
| | From where you get menstrual products at university? N=400 (for each choice) | Home | 337 | 84.3 |
| | | Cafeteria | 112 | 28.0 |
| | | University clinic | 41 | 10.3 |
| | | Faculty club | 3 | 0.8 |
| | | Friend | 6 | 1.6 |
| | It is comfortable to get menstrual products from: N=399* (for each choice, multiple response) | University | 33 | 8.3 |
| | | Pharmacy | 202 | 50.5 |
| | | Supermarket | 110 | 27.5 |
| | | Sport club | 12 | 3.0 |
| | | Not comfortable at all | 154 | 38.5 |
| Other | Have you ever used a menstrual product for longer than it is recommended because you did not have a replacement? N=399* | Always | 9 | 2.3 |
| | | Sometimes | 55 | 13.8 |
| | | Never/few times | 303 | 75.9 |
| | | I do not know | 32 | 8.0 |
| | Have you ever used a menstrual product for longer than it is recommended because you could not find appropriate washing facilities? N=399* | Always | 55 | 13.8 |
| | | Sometimes | 161 | 40.3 |
| | | Very few times | 71 | 17.8 |
| | | Never | 98 | 24.5 |
| | Are you embarrassed to buy menstrual products? N=397* | I do not know | 14 | 3.5 |
| | | Always | 43 | 10.8 |
| | | Sometimes | 117 | 29.5 |
| | | Never/few times | 177 | 44.6.0 |
| | | Someone else buy them for me | 60 | 15.1 |

*Totals are less than 400 because of missing data.

from LMICs was associated with negative menstrual experiences throughout reproductive life and might have a negative impact on general health and well-being of girls and women.²⁰

Mothers were the main source of menstrual health information globally at varying levels. The majority of our respondents reported that the primary source of information was their family (74.1%), which is not surprising as it conforms to reports from LMIC mapping study,¹⁵ in which a range of 53%–92.2% reported mothers as the primary source of information in the three studies from Egypt. Mothers were also the main source of information in a study among university students from Saudi Arabia (66.8%),⁴⁷ Ghana (73.4%)⁴⁸ and India (50.3%).⁵² When the mother was the main source of information, students reported being more ready for menarche with better knowledge and positive attitude.⁴⁷ Regardless of source of information, being prepared made menarche experience easier. In Palestine, the family continues to be the main source of support (physical, psychosocial and financial) for children until they start their own families. Mothers are the close family member for females to discuss sensitive feminine issues like menstruation, where discussion would include guidance on personal hygiene and the use of sanitary pads and for Muslims, issues related to Islam guidelines such as impurity and purity practices.⁵³ The second common source of menstrual information in our study was the school (69.3%), which was much higher than percentages reported by 1010 female college students from India (19.5%).⁵² Similarly, a study among university students from Saudi Arabia reported that their main source of information was their mothers (66.8%), followed by teachers (37.2%), while the least source of information was reported to be healthcare providers (physicians and nurses) (4.2%).⁴⁷ Supportive behaviour from school teachers was also observed in facilitating an intervention study on the use of menstrual cups by correcting misconceptions and encouraging its use.⁵⁴ Female teachers seem to be well trusted to be consulted for menstrual issues by Palestinian females. As the first author is a female university instructor, nurse and midwife at the Department of Nursing, she receives many queries related to menstruation issues from female university students and colleagues while on campus. Around two-thirds of our respondents (66%) demanded more information on different menstruation topics. This necessitates investing in national intervention programmes to improve the knowledge of women in the community, female school teachers and female university instructors to meet the informational needs of school girls and female university students.

The availability of various menstrual hygiene products at affordable prices facilitates access of users to choose according to their needs and socioeconomic status. In our study, the majority of university students reported using single-use pads. This is consistent with findings among university students from Ghana where the majority use sanitary pads during their menstruation⁴⁸ and from other LMICs, particularly studies from Egypt.¹⁰ The students at BZU come from different socioeconomic backgrounds. Despite the expensive living costs in the middle zone of the West Bank where BZU is located, female students are

still able to access disposable sanitary pads. Thus, it was not surprising for us to find that 14.5% reported that menstrual products are expensive, some of them lacked the money to buy these products and about one-fourth used alternative cheaper products such as toilet paper, nappies and reusable clothes, which reflects the financial challenges and menstrual poverty among female students at BZU. Furthermore, when answering questions related to financial access to menstrual products, we got students who chose to answer 'I do not know' ranging from 4% to 22.7%, which may reflect feelings of discomfort, shame and denial of their financial situation. Although reusable clothes are considered environmentally friendly,⁵⁵ they frequently leak, are uncomfortable and are associated with urogenital infections.¹⁰ It is not a practical choice for female students who spend long hours at the university attending lectures and laboratory sessions.

Inadequate facilities for menstrual hygiene management in university campuses,^{12 20} workplaces and schools including lack of water, soap, privacy, lighted toilets, dustbins and sanitary pads were constraints for many university students and were associated with non-hygienic menstrual practices and lack of confidence in managing their menstruation while at the university,¹² such as keeping menstrual products longer than recommended during menstruation as reported by our participants and absenteeism due to fear of leakage and staining and poor menstrual hygiene.^{10 55} About 21.3% of students from India reported no tap water, and 80.1% reported no soap for hand washing in toilets when they visited in colleges,⁵² which is similar to our context where 72% of participants reported using menstrual products longer than recommended due to absence of appropriate washing facilities on campus. The lack of appropriate facilities within campus has negatively influenced our participants' feelings of confidence as 84% feel scared of staining clothes with blood when menstruating. The availability of private and clean bathroom facilities was identified as among the strong predictors of confidence to manage menstruation among university students in Australia.¹²

Strengths and limitations

This study has some strengths and limitations. The main strength of this study is that it is the first to be done among Palestinian university students. Furthermore, we used an international research tool for investigating menstrual health that was implemented by other researchers from other countries, which allows for comparison. The study can be replicated in other universities. The main limitation of this study is that it was conducted at one university (BZU), which can limit its generalisability. However, BZU is a large university, teaches 119 specialties via 9 faculties, includes approximately more than 15 000 students, is centrally located in the West Bank and attracts students from all over the West Bank governorates. This has helped us to recruit and closely follow up our distributed questionnaires in person among students at the time when COVID-19 restrictions were still ongoing among

other universities. The second limitation is that data were collected by a self-administered tool, with possible misinterpretation of questions. We tried to decrease bias by piloting the tool, adjusting some questions after the pilot, and the research team stayed around participants during data collection in case they had questions. The third limitation is that our sample was a convenience sample. However, we used a simple random sample size calculation formula for finite population and increased it by 10% to account for this non-random sampling. Furthermore, as we used an international tool for our data collection, and due to its length, some data related to demographic and socioeconomic status that might affect menstrual health and hygiene were not collected. However, the questionnaire has few questions that were used as proxies for socioeconomic status, which might affect menstrual health and hygiene. The availability of these proxy questions that gave us a clue into students' financial situation discouraged us to adding new questions to our Arabic version as the questionnaire is already too long, and adding direct questions related to financial situation could cause further embarrassment/unnecessary negative feelings to female students.

Conclusion

This study presents baseline information on menstrual health and hygiene among Palestinian female university students. Female university students were not adequately prepared for menstruation and are currently demanding more information on menstruation. The main sources of information were mothers and schools. Furthermore, our findings pointed to inadequacy of WASH facilities at the campus and to the presence of menstrual poverty among female university students at BZU. Universities should ensure and regularly monitor the availability of various types of menstrual products at an affordable price inside the campus. It is also crucial to monitor the availability and readiness of WASH facilities inside the campus including clean, lighted, functional toilets with lockers, water, soap, toilet paper and dustbins to enable students to manage their menstruation safely and with dignity. Finally, a national intervention programme is needed to increase awareness regarding menstrual health and hygiene among women in local communities and female teachers in schools and universities to enable them to disseminate information to and meet the practical needs of girls at home, at school and at the university.

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Ethics approval Ethical approval was obtained from the Research Ethical Committee (REC) at the Faculty of Pharmacy, Nursing and Health Professions at Birzeit University (BZUPNH117). Verbal consent was used to recruit participants. Then, written consent was obtained by including it as the first page of the questionnaire for participants to read and agree. Information about the aims of the study, length of the questionnaire, confidentiality, consent to participate, and right to refuse to participate or answer any question or withdraw at any point was also ensured.

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