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ORIGINAL ARTICLE

The Understanding and Perception of the Menstrual Cup Among Medical Students

Chelene Ganz[1] · Eliezer Lever[1] · Juane Bredenkamp[1] · Lindiwe Mponda[1] · Thabelo Ramaru[1] · Woniso Mazonde[1] · Sekedi Chuene[2] · Langanani Mbodi[3]

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Abstract

Background Menstruation and menstrual health management remains a challenge worldwide, largely owing to gender inequality, social and cultural stigma, inaccessibility, and poverty. Menstrual cups may offer solutions to the many challenges. The role of medical students in the promotion of women's health cannot be understated.

Objectives To investigate the understanding and perception of medical students on the use, safety, and efficacy of the menstrual cup as a menstrual hygiene product.

Methods This was a prospective, cross-sectional, quantitative study conducted at the University of the Witwatersrand on medical students. Questionnaires were emailed to students. The study was approved by the Wits HREC (M200885). Statistical software SPSS® 23.0 was used.

Results Two hundred and fifteen participants were recruited. One hundred and seventy-eight were included and analyzed; 58.93% had a basic understanding of the menstrual cup as a menstrual hygiene product ($p < 0.001$). There was an association between the gender of the respondents and knowledge of the device ($p < 0.0001$). Females were 7.467 times more likely to have heard about it. There was an association between gender and understanding the cost-effectiveness ($p = 0.01$), the year of study, and understanding of how it works ($p = 0.012$). The majority perceived the menstrual cup as convenient in terms of use, comfort, hygiene, and safety.

Conclusion It is important that the menstrual cup is not only introduced to society but also promoted and receives endorsement by healthcare workers. There is an understanding regarding the use, safety, and efficacy of the MC and a willingness to advise for use.

Keywords Menstrual Hygiene Products · Menstrual Cup · Menstruation · Perception of Menstrual Cup

Introduction

Investing in women's health does not only make a compelling case economically and socially but is a fundamental human right [1]. An individual's current health translates to future health, with a cumulative impact spanning generations [2]. Menstruation and menstrual health management (MHM) remains a challenge worldwide, largely owing to gender inequality, social and cultural stigma, inaccessibility, and poverty [3]. The lack of adequate MHM products has an impact spanning from workplaces to schools, ultimately influencing active participation in daily community life, education, and the livelihood of females. In February 2011, the South African government pledged to provide free sanitary pads to women who could not afford them [4]. This makes a compelling case for urgent and necessitous

✉ Langanani Mbodi
Langanani.mbodi@wits.ac.za

[1] Department of Clinical Medicine, University of Witwatersrand, 7 York Street, Parktown, Johannesburg 2193, South Africa

[2] Department of Obstetrics & Gynaecology, University of Witwatersrand, Chris Hani Baragwanath Academic Hospital, 26 Chris Hani Road, Diepkloof, Soweto, Johannesburg 1864, South Africa

[3] Department of Obstetrics and Gynaecology, University of Witwatersrand & Charlotte Maxeke Johannesburg Academic Hospital, 7 York Road, Parktown, Johannesburg 2193, South Africa

MHM, particularly in vulnerable communities and developing countries, which could potentially be addressed by the menstrual cup (MC). Albeit it is more costly initially, in the long-term the MC provides a cost-effective and environmentally friendly, reusable alternative to classical disposable menstrual hygiene products.

The MC is an MHM product made of flexible, medical-grade silicone, allowing it to be folded and inserted into the vaginal canal for the collection of menstrual fluid during a menstrual cycle [5, 6]. There are two types of MC: the vaginal cup which is bell-shaped and the cervical cup which resembles the diaphragm [7]. They come in two different sizes: The smaller size is for nulliparous females or women younger than 30 years, while the larger size is for those who are older and have had vaginal birth [7]. MCs can be retained for up to 12 h before emptying the contents [8] [9]. It is reusable and can have a lifespan of 5–10 years [5, 8, 9, 10]. With this comes an MHM solution that, when used properly, can provide the most long-term solution for women and girls alike. A study conducted on nulliparous, Caucasian women in Canada [10] [11] and one done on multiparous women in Durban [6] suggests that the safety and acceptability of the menstrual cup as an MHM product may be universal despite differing sociodemographic situations.

Materials and Methods

Research Design

This was a prospective, cross-sectional study looking at quantitative data.

Study Site and Study Population

The study was conducted at the University of the Witwatersrand, Parktown Health Science Campus, Johannesburg, South Africa.

The study recruited medical students (GEMP I-IV) enrolled at the University of the Witwatersrand in the 2021 academic year. The Graduate Entry Medical Programme (GEMP) at the University of the Witwatersrand is the equivalent of the third to the sixth year in the MBBCh medical program. The exclusion of MBBCh years 1 and 2 in the study population was because they are pre-clinical years. Participation was voluntary upon invitation through the university email system.

Inclusion and Exclusion Criteria

All registered students who are GEMP1-4 of either gender who are above 18 years of age were included. Students enrolled in other non-medical degrees were excluded.

Data Collection

Data were collected through Google Forms. These were used to convert our data form into an electronic questionnaire. We requested permission from the respective year coordinators to send out the survey to GEMP I–IV medical students on our behalf. These were sent out via student emails. All questions were in a multiple-choice format.

Before filling in the questionnaire, the students received an informative consent form, stating what the study is about, and that they understood the information and consented to partake in the study.

Ethical Issues

Ethics approval was received from the Wits Human Research Ethics Committee (Clearance Certificate M200885) before distributing questionnaires. All participants received an informative consent form along with the questionnaire reassuring them that participation is completely voluntary and that all responses were anonymous. Participants were also informed that they may withdraw at any point during the questionnaire filling, should they wish to do so, without any repercussions.

Data Analysis

The statistical software SPSS® statistics, version 23.0, Armonk, New York, 2015, was used to analyze the raw data received from the online questionnaires.

Descriptive statistics and *t*-tests were performed on survey data aimed at evaluating the basic understanding of the MC among the medical student cohort. For each survey question, respondents were given a choice of five options ranging from strongly disagree to strongly agree with the statement presented. Responses were graded using a numerical grading system ranging from 1 to 5 where a statistically significant deviation from the average response of 3, a neutral response, was considered noteworthy.

Logistic regression analysis was performed to allow for the generation of a mathematical relationship between dependent and independent variables. This was used to analyze the association between underlying variables, such as year of study and understanding.

Chi-squared tests were used to calculate the difference between the frequencies of responses. This allowed for the assessment of an association between understanding and categorical variables (age groups; male/female).

Table 1 Demographic information of respondents

Variable	Description	Frequency	Percentage
Sex	Male	27	15.17
	Female	150	82.27
	Chose not to disclose	1	0.56
Age groups	18–24 years	159	89.33
	25–30 years	19	10.67
Year of study	GEMP I/MBBCh III	80	44.94
	GEMP II/MBBCh IV	56	31.46
	GEMP III/MBBCh V	21	11.80
	GEMP IV/MBBCh VI	21	11.80

Results

The study recruited 215 students through the university email system. Thirty-seven students were excluded as they did not meet the inclusion criteria. The final number of students included and analyzed was 178 students. The demographics of the study population are described in Table 1.

Basic Understanding of the Menstrual Cup as a Menstrual Hygiene Product

The majority of respondents, 58.93%, agree that they have a basic understanding of the MC as a menstrual hygiene product (MHP), in comparison with 21.17% of respondents who did not. There were 19.91% of respondents who opted to be neutral in their responses.

Regarding the understanding of how the MC works, a mean response of 3.460 was found; however, the *t*-test results show that this mean is significantly different from the average response of 3 (neutral) with a p-value ≤ 0.001, thus indicating that the respondents agree that they understand how the menstrual cup works (mean > 3 with a difference of 0.459).

A statistically insignificant p-value of 0.675 was found with a mean response of 3.033 regarding convenience in the use of the menstrual cup. This implied that respondents were undecided as to whether the MC is more convenient to use than other MHPs.

Mean response of 4.227 was found in terms of whether the MC is a more cost-effective alternative to other MHP such as tampons or sanitary pads. With the statistically significant p-value < 0.001, the results suggest that respondents agree that the MC is a more cost-effective alternative to other MHPs described further in Table 2.

Perceptions of the Use of the Menstrual Cup

Descriptive statistics and *t*-tests were performed on survey data aimed at understanding the perceptions of the

Table 2 Basic understanding of the menstrual cup and perception of menstrual cup as a menstrual hygiene product

		S-D	*D*	*N*	*A*	*S-A*	Dispersion			*T*-test (Test value = 3)			
		1	2	3	4	5	Total	Mean	SD	STd err	*t*-test	df	*p*-	Mean difference
Would you say you understand how the menstrual cup works (i.e., would you be able to explain to someone how to use a menstrual cup)	Freq	23	33	34	66	55	211	3.460	1.321	0.091	.055	210	0.000	0.4597
	%	10.9	15.64	16.11	31.28	26.07								
Would you say the menstrual cup is more convenient to use that other menstrual hygiene products	Freq	20	50	69	47	25	211	3.033	1.146	0.079	0.420	210	0.675	850.0332
	%	9.48	23.7	32.7	22.27	11.85								
Would you say the menstrual cup is a more cost-effective alternative to menstrual hygiene products such as tampons/pads	Freq	6	2	23	87	93	211	4.227	0.892	0.061	19.990	210	0.000	1.2275
	%	2.84	0.95	10.9	41.23	44.08								
Average	%	7.74	13.43	19.91	31.6	27.33	211	3.57	1.12	0.08	8.49	210	0.000	0.573

S-D Strongly disagree, D Disagree, N Neutral, A Agree, S-A Strongly agree, SD Standard deviation

menstrual cup among the medical student cohort. *T*-test results showing a significant deviation from the average response of 3 (neutral) were considered noteworthy. Overall, the consensus as to whether the menstrual cup is difficult to insert remained equivocal, with an average response rate of 2.986 (p-value = 0.809).

By contrast, perceptions about the difficulty of its removal and cleaning showed a mean response rate of 2.720, indicating that a significant proportion of respondents (p-value < 0.001) thought it to be easily removed and cleaned. These data agree with the sentiment that the menstrual cup is a hygienic alternative to other MHPs (p-value < 0.001), with respondents disagreeing with the statement that the menstrual cup is unhygienic and an unsafe alternative as evidenced by a p-value < 0.001.

Similarly, the degree of comfort in use appeared to be comparable with other MHPs, with a significant proportion of respondents disagreeing with the statement that the MC is more uncomfortable compared with other menstrual hygiene counterparts (p-value = 0.002). Based on the perceptions highlighted in the points above, it is not surprising that a significant proportion of respondents (p-value < 0.001) reported that as future healthcare workers, they would recommend the MC as a menstrual hygiene alternative to future patients. Figure 1 shows the graph of the perceptions of participants regarding the menstrual cup as a menstrual hygiene product.

Ages

The mean age of the respondents was 21.5 years (SD ± 2.15) with the minimum age being 18 years and the maximum age being 30 years.

The Level of Association

There was no statistically significant association between age group and understanding of the menstrual cup (p-value > 0.05).

There was an association found between the gender of the respondents and knowledge of the MC (p-value < 0.0001). Females were 7.467 times more likely to have heard about the MC than males. There was an association between gender and understanding of the cost-effectiveness of MC (p-value = 0.01).

There was an association between academic level and understanding that the MC needs to be removed and emptied more often than pads and tampons (p-value = 0.041).

There was also an association between the year of study (YOS) and understanding of how the MC works (p-values = 0.012). Data show that GEMP IV students have a better understanding than students in lower years of study.

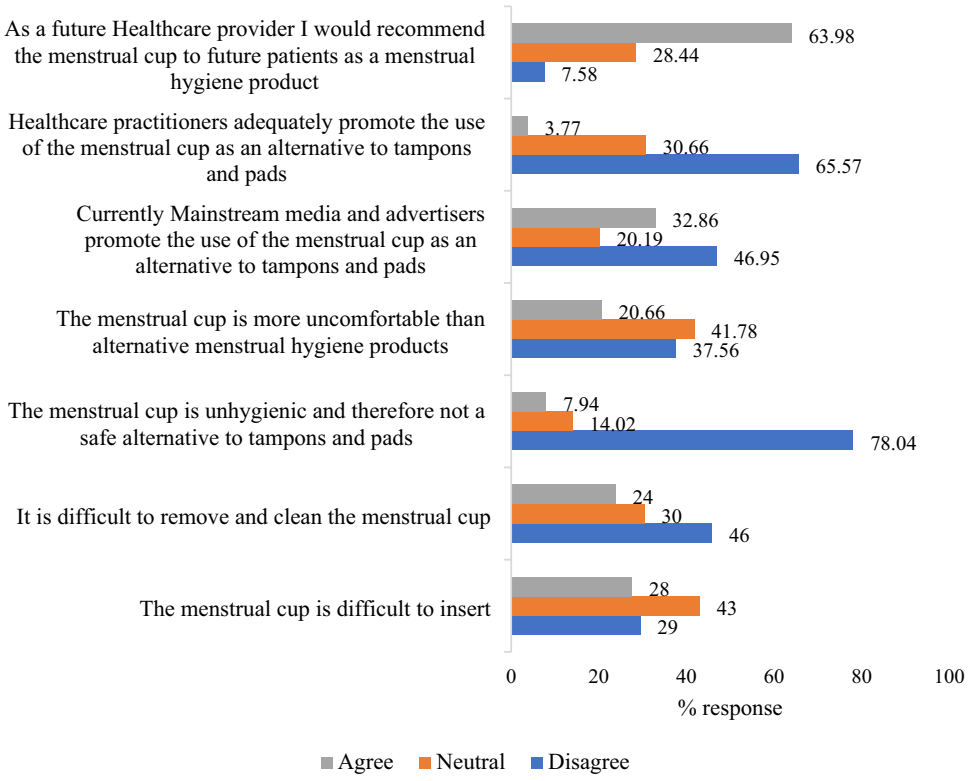

Fig. 1 Graph depicting the perceptions of participants regarding the menstrual cup as a menstrual hygiene product

Logistic Regression

Binomial logistic regression analyses were performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that respondents have heard about the MC. The logistic regression model showed statistical significance with c^2 (6) = 19.593, $p = 0.003$ (p-value < 0.005). The model explained 23.0% (Nagelkerke R^2) of the variance in hearing and correctly classified 91.6% of cases. Female respondents were 7.467 times more likely to hear about menstrual cups than males. Additionally, increasing age was associated with a reduction in the likelihood of hearing about MCs.

Binomial logistic regression was performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that respondents perceive that insertion of the MC may break the hymen in individuals who have not had sex before. The logistic regression model was statistically insignificant with X^2 (6) = 4.906, $p = 0.556$ (p-value > 0.005). The model explained 3.70% (Nagelkerke R^2) of the variance in hearing and correctly classified 60.5% of cases. Increasing age was not associated with an increase in the assumption that insertion of the MC may break the hymen in individuals who have not had sex before.

Binomial logistic regression was performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that the respondents understand that the MC needs to be removed and emptied more often than pads and tampons. The logistic regression model was statistically insignificant with X^2 (6) = 5.243, $p = 0.513$ (p-value > 0.05). The model explained 5.1% (Nagelkerke R^2) of the variance in hearing and correctly classified 84.3% of cases. An increase in age was associated with an increase in the likelihood of an assumption or understanding that an MC needs to be removed and emptied more often than pads and tampons.

Binomial logistic regression was performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that the respondents understand that the MC needs to be sterilized after every use. The logistic regression model was statistically significant with X^2 (6) = 18.003, $p = 0.006$. The model explained 16.6% (Nagelkerke R^2) of the variance in hearing and correctly classified 84.2% of cases. An increase in age was associated with an increase in the likelihood of assumption or understanding that an MC needs to be sterilized after every use.

Binomial logistic regression was performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that the respondents understand that the menstrual cup can hold a maximum of 10 ml of blood. The logistic regression model was statistically insignificant with X^2 (6) = 9.109, $p = 0.168$ (p-value > 0.005). The model explained 16.8% (Nagelkerke R^2) of the variance in hearing and correctly classified 60.8% of cases. An increase in age was associated with a reduction in the likelihood of assuming or understanding that the menstrual cup can hold a maximum of 10 ml of blood. Hence, those in higher years of study were more likely to understand that the MC can hold more than 10 ml of menstrual blood.

Binomial logistic regression was performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that the respondents understand that the use of the MC is associated with increased vaginal infections compared to non-insertable products. The logistic regression model was statistically insignificant with X^2 (6) = 6.455, $p = 0.374$ (p-value > 0.005). The model explained 4.9% (Nagelkerke R^2) of the variance in hearing and correctly classified 66.5% of cases. An increase in age was associated with a slight increase in the likelihood of assuming or understanding that the use of the menstrual cup is associated with increased vaginal infections compared with non-insertable products. However, this was not statistically significant.

Binomial logistic regression was performed to ascertain the effects of age, sex, degree, and YOS on the likelihood that the respondents understand that the use of the MC is associated with an increased risk of menstrual toxic shock syndrome. The logistic regression model was statistically insignificant with X^2 (6) = 7.529, $p = 0.275$ (p-value > 0.005). The model explained 6.1% (Nagelkerke R^2) of the variance in hearing and correctly classified 72.4% of cases. An increase in age was associated with a reduction in the likelihood of assuming or understanding that the use of the menstrual cup is associated with a reduction in the risk of menstrual toxic shock syndrome.

Discussion

In a Pakistan study, the main source of information regarding menstruation was reported to be the mothers of participants in 58.5% of Pakistan's general population and 53.1% of healthcare workers (30). There was a small portion of about 28% from both these populations who were completely aware of the physiology of menstruation. The majority of females were not aware of menstrual cups (88.6% of females from the general population and 57.6% of the healthcare workers) [11]. However, in our study that included only medical students who are by virtue of the academic curriculum, and knowledgeable on the physiology of menstruation, we still found that only about 60% of them were aware of MCs. It was expected that, unlike the general population, there will be a larger proportion that is fully informed about this MHP. We also found that among medical students, females were more likely than men to have heard about MCs. However, there was an insignificant association between sex and understanding of the MC.

In the above Pakistan study, the most common reason among healthcare workers for not favoring the use of the MC was that it was perceived as uncomfortable or strange to use [11]. In our study, medical students responded that HCWs inadequately promoted the use of the MC as an alternative to tampons and pads. And that as future healthcare providers, they would recommend the MC to future patients as an MHP. However, it must be noted that our study participants were not users of the MC.

Furthermore, in Pakistan, the majority of the general population's reasons for not using the MC was that it was unavailable in local shops and unaffordable (p-value = 0.049) [11]. Our study population responded that they find the MC cost-effective (p-value < 0.001), but not convenient, compared with other MHP. It is noted that most of the students have not used or seen the MC and hence their responses may be more presumed expectations about the product. The reason for this may be due to a lack of promotion by mainstream media and advertisers as evidenced in our results.

A binomial logistic regression that was done showed that there was no significant association (X^2 (6) = 7.529, p = 0.275) between age, sex, YOS, and the likelihood of the respondents understanding that the use of the MC is associated with increased risk of menstrual toxic shock syndrome.

A large number of our study population were neutral about the comfort and ease of use of this MHP. With the average response of 2.775 being less than 3 (p-value < 0.001), they disagreed that the menstrual cup is more uncomfortable than alternative MHP. However, unlike the systemic review and meta-analysis of studies of girls and women [7] who expressed concerns including pains and reproductive harms including fertility, there was no association with sex/gender in this regard.

The Iranian study reported a high level of acceptability and safety of the menstrual cup, and they concluded that this showed that the MC is a suitable alternative for menstrual management. They thought these findings will help healthcare providers to learn more about the potential advantages and disadvantages of using the cup and create trust in menstrual cup use [12]. A South African randomized control trial comparing pads/tampons and MC reported the MC rated significantly better for comfort, quality, menstrual blood collection, appearance, and preference that along with the likelihood of continued use, a recommendation of the product, and future purchase of this product increased over time [6]. Our study reports that the majority of participants are ready to recommend its use and encourage women to use it. There is hope that those who do not have adequate knowledge of the MC will learn more and there will be an increased recommendation and use of MC. To the best of our knowledge, this is the first study on senior medical students in our country. However, it is acknowledged that it was conducted on one campus. It offers an opportunity for large multi-centered studies.

Conclusion

The MC is an essential MHP, especially in low- and middle-income countries such as ours. It is important that the product is not only introduced to society but also promoted and receives endorsement by healthcare workers. There is increased understanding regarding the use, safety, and efficacy of the MC among medical students. As further supported, the majority of respondents have agreed that they had a basic understanding of the MC as an MHP and that it is a more cost-effective alternative to other MHPs such as tampons and pads. And this understanding increased proportionally to the YOS. In addition, medical students were found to be willing to advise, encourage, and advocate for the use of the MC as an MHP.

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Author contributions Chelene Ganz, Eliezer Lever, Juane Bredenkamp, Lindiwe Mponda, Thabelo Ramaru, and Woniso Mazonde contributed to the conception, design, and drafting of the manuscript and critically reviewed the manuscript for relevant intellectual content. Sekedi Chuene and Langanani Mbodi contributed to the conception and the supervision of the study and reviewed the intellectual content of the write-up. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval and consent to participate Ethics approval was obtained from the Wits Human Research Ethics Committee (Clearance Certificate M200885) before distributing questionnaires. All participants received an informative consent form along with the questionnaire reassuring them that participation is completely voluntary and that all responses were anonymous. Participants were also informed that they may withdraw at any point during the questionnaire filling, should they wish to do so, without any repercussions.

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