

# Evaluation of the safety and comfort of menstrual cup during sport: A prospective cohort study.

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## Research Article

**Keywords:** exercise, menstrual hygiene products, patient comfort, menstrual cup

**DOI:** <https://doi.org/10.21203/rs.3.rs-45210/v1>

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# Abstract

**Objectives:** to evaluate the the acceptability of menstrual cup during sport.

**Design:** prospective cohort study. Setting: São Paulo, Brazil.

**Participants:** a total of 49 female handball players with a mean age of  $22 \pm 2$  years.

**Intervention:** participants were invited to use Softcup® disposable menstrual during three menstrual cycles.

**Main outcome measures:** Overall satisfaction; secondary outcomes included ease of insertion and removal of the device, pain, discomfort in sexual intercourse, blood leakage and / or loss of the menstrual cup during sport.

**Results:** The degree of overall satisfaction during sport was high (82%). The insertion and removal of the menstrual cup was considered easy by most users, and the degree of satisfaction increased in subsequent cycles. The complaint of menstrual flow leakage during sport occurred in 63.3% of the athletes in the first cycle and fell to 42.9% in the last cycle ( $p > 0.05$ ). There was loss of the device during exercise in 36.7% of the athletes in the first cycle, 30.6% in the second and 26.5% in the third cycle ( $p > 0.05$ ). Of the athletes who had sexual intercourse with the collector, 90.9% of them had no discomfort.

**Conclusion:** although the leakage and loss of the device may occur during the sport, the acceptability of the menstrual cup was high among the female athletes.

## Introduction

The menstrual cup is a non-absorbable barrier device, its function is to collect menstrual blood internally within the vaginal canal.<sup>1</sup> There are also several brands of menstrual collectors, which feature different designs and models, are most commonly made of latex, silicone and biocompatible polymers.<sup>2,3</sup>

Reusable collectors, mostly made of silicone and latex, are becoming popular because they are a more economical and environmentally sustainable alternative to the usual menstrual pads.<sup>4</sup> The reusable collectors are conical in shape, should be introduced into the vaginal canal, with the woman in a relaxed and comfortable position and at the time of withdrawal it is necessary for the woman to compress the device in order to remove the vacuum formed between the cup and the cervix.<sup>5</sup>

Sexual practice is contraindicated during the permanence of the cup within the vaginal canal, and it should be washed with neutral soap and water at each withdrawal before reinsertion and always boiled at the end of each cycle<sup>6</sup>.

The disposable collectors, on the other hand, have been gaining ground in the “menstrual products” market due to the practicality they offer, and mainly because it gives women complete freedom during

their menstrual period<sup>7</sup>. Moreover, this device allows you to have sex and exercise in a comfortable and practically imperceptible way<sup>8</sup>. Menstrual cup have numerous benefits over conventional menstrual pads and tampons<sup>9</sup>. Women who usually used tampons and who started using menstrual collectors report advantages in the parameters of leakage and comfort.<sup>3</sup> In addition, as collectors are unable to absorb vaginal fluids, unlike buffers, pH and vaginal microbiota are unchanged, which minimizes the risk of mucosal irritation and infections<sup>10</sup>.

After analyzing the numerous benefits of menstrual collectors over other methods, it would be a huge advantage for female athletes to associate all this practicality with the world of female sport<sup>11</sup>. However, there are no reports in the literature evaluating the use of “menstrual products” (conventional pads, tampons or menstrual collectors) in athletes.

Considering that menstrual periods can influence sports performance, the aim of this study was to evaluate the the acceptability of menstrual cup among university athletes

## Methods

A cross-sectional study was conducted with the participation of 49 university athletes, aged between 18 and 35 years old, who had a natural menstrual cycle or through hormonal contraception.

The disposable menstrual cup (Softcup®), distributed by the company DKt, from Brasil, was used. The device is presented in only one size and is formed by a flexible ring and a reservoir of thin material composed 100% of ultra low density polyethylene (figure 1). The product can be used for up to 12 hours straight and does not need to be removed for urination, swimming or physical activity.

The athletes were instructed to insert the device into the vagina during sitting or squatting position, flexing the ring in half (figure 1). To remove the collector, the participant was instructed to insert the finger into the vagina and pull the cuprim during bath. The product should then be discarded and a new one could be inserted next.

Athletes who used an intrauterine device (IUD), who have recently given birth, or who have had Toxic Shock Syndrome will not be able to use the product<sup>12</sup>.

At the initial visit, participants answered a questionnaire about demographic info, personal history, gynecological history and general status. After that, they went through anthropometric measurements (weight, height, waist circumference), vital signs (blood pressure and heart rate).

The menstrual cup was handed with a monthly follow-up form. The users used the menstrual cup for three consecutive cycles and had to evaluate the following parameters: ease of insertion and removal of the collector, complications during use (leakage, pain, infection or loss of the device).

Menstrual blood loss during sport was defined as any leakage that would make the athlete remove the collector. Overall satisfaction was measured at the end of the study using three levels of satisfaction: “Not at all satisfied” to “Very Satisfied” or “Extremely Satisfied”.

The sampling technique was by way non-probability sampling using 49 menstrual cup who were donated by the company. Quantitative variables were analyzed by means and standard deviations and quantitative variables by percentages. The comparison of continuous variables with normal distribution was made by the t test. Qualitative variables were compared by chi-square test or Fisher's exact test. The null hypothesis was set at 5% ( $p < 0.05$ ).

## Results

Table 1 shows the characteristic of the sample. The average age was  $22 \pm 2$  years and average body mass index of  $23 \pm 3 \text{Kg/m}^2$ . Most had an active sex life (84%) and were nulliparous (96%). Table 1 shows that only eight athletes had intense menstrual flow.

The insertion and removal of the menstrual cup was considered easy by most users, and the degree of satisfaction increased in subsequent cycles (Table 2). Feeling of discomfort and pain while using the device was not common. However, although menstrual flow leakage complaints decreased in subsequent cycles, it was present in more than 50% of participants.

More than half of the participants (33 athletes) used the menstrual cup during intercourse and most of them (90.9%) had no discomfort, being one of the main reasons why the participants would recommend the use of the device.

The use of menstrual cup during training or competition did not cause inconvenience for most users. However, it is observed in figure 2 that during physical exercise menstrual escape occurred in 36.7% of athletes in the first cycle, 30.6% in the second and 26.5% in the third cycle. Although menstrual leakage decreased with use, the difference was not statistically significant ( $p = 0.5$ ).

The degree of overall satisfaction during sport was high (82%). Of those who were unsatisfied (nine participants), the main reason was leakage during exercise (four), followed by discomfort (three). One athlete reported that she would not continue to use the device because it is not reusable, which she considers to be environmentally unsustainable, and one athlete reported vaginal infection following the use of the collector, and her physician contraindicated the method.

## Discussion

The disposable menstrual cup was initially marketed in the United States in 1996. The product is composed of a combination of biocompatible polymers, ensuring the product no irritation, mutagenicity, or toxicity when in contact with the vaginal epithelium<sup>6</sup>.

Menstrual cups have numerous benefits over conventional menstrual pads and tampons. Women who usually used tampons and who started using menstrual cup report advantages in the parameters of leakage and comfort<sup>4</sup>. Moreover, as collectors are unable to absorb vaginal fluids, unlike tampons, pH and vaginal microbiota are not altered, which minimizes the risk of mucosal irritation and infections<sup>13</sup>.

It seems to be a tendency that younger women are looking for new menstrual hygiene products. In this sense, menstrual cups have become popular and many studies on efficacy, safety and comfort have appeared<sup>14-15</sup>. The profile of the athletes evaluated in this study is similar to the public looking for these vaginal devices: young people with active sex life and who practice regular exercise<sup>16,18</sup>

The amount of menstrual flow may be a limiting factor to the use of the collector. Although insertion and removal of the menstrual cup was considered easy by most athletes, the complaint of menstrual flow leak was present in more than half of the participants. Similar results were found in the "Finding Lasting Options for Women (FLOW) Study: Multicentre randomized controlled trial comparing tampons with menstrual cups"<sup>4</sup>.

However, research shows that women gain experience in using the cup over the three cycles, with their complaints of leakage and discomfort gradually reduced. There is also a direct relationship between the menstrual flow leakage complaint with the use of the cup, equivalent to the leakage that occurred with their previous methods<sup>16</sup>. In our study, we found similar results when athletes had menstrual escape during training, with a noticeable reduction of this complaint by approximately 10% over the following cycles, corroborating the hypothesis that the method of insertion and positioning of the cup improves with the frequent use.

Despite the safety and local response of the disposable menstrual collector, one athlete reported an episode of vaginal infection, but without supporting diagnostic data and/or occasional physical examination. Similar results were found through severe post-market surveillance of the device in over 100 million users<sup>4</sup>. In this large follow-up, they evaluated pH and vaginal microbiota, urine examination, cervical oncotic colpocytology and colposcopy in women who used the menstrual collectors for three months, and no adverse effects were proven<sup>7</sup>.

It is noteworthy that most athletes did not have any discomfort during sexual intercourse, which is one of the main reasons why participants would recommend the use of the device.

The degree of general satisfaction with menstrual cup during physical exercise was high, suggesting that the device does not interfere with sports performance. This result goes against a previous report, in which the majority of participants felt comfortable during the sport<sup>6</sup>.

Approximately 66% of respondents said they would continue to use the device during their menstrual periods, not just inside the courts, but also in their daily lives. This success is repeated in several studies, especially when the cups compared to other available methods, such as vaginal tampons<sup>4</sup>. Less than 1/3 of our participants reported discontinuing use of the cup after study completion, the most frequent

argument being the high financial cost versus benefit. This problem has not been reported by previous studies<sup>4,6,14</sup>.

The main limitation of this work is the relatively small sample size and the use of a non-probability methodology. Furthermore, we analyzed only handball players and the conclusions drawn cannot be inferred to the whole population engaged in sports. Future studies are needed, with larger sample sizes, sport modalities and should seek to compare a variety of menstrual cup.

## Conclusion

In conclusion, although the menstrual leakage and loss of the device may occur during the sport, the acceptability of the menstrual cup was high among the university athletes.

### Key points

- This study evaluated the experiences of female athletes using menstrual cups during physical exercise over a period of 3 menstrual cycles
- Overall satisfaction with the use of the menstrual cup was high and most athletes reported that they would continue to use the device after the study
- Although the loss of the menstrual cup occurred during sport, it decreased with continued use and did not affect the prevalence of side effects
- Menstrual cups are an excellent alternative for women who exercise and can be safely recommended

## Declarations

1) Institutional Review Board of Anhembi Morumbi University approved our study protocol (CAAE 59031416.0.0000.5492).

2) The respondents read and signed an informed consent before starting survey and consented to participate and publish.

3) The authors declare that they do not involve conflicts of interest, including personal, commercial,

academic, political, or financial interests related to the topic or materials discussed in the manuscript.

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## Tables

Table 1: Main sociodemographic and clinical characteristics of the analyzed athletes.



Variable	Parameter	No. (%)
Age	19-21	23 (47)
	22-24	21 (43)
	25-30	5 (10)
Pregnancy	Yes	2 (4)
	No	47 (96)
Age of menarche (year)	9-15	47 (96)
	>16	2 (04)
Life sexual	Yes	41 (84)
	No	8 (16)
Menstrual bleeding	Mild	17 (29)
	Moderate	24 (49)
	Heavy	8 (22)
Body mass index (Kg/m <sup>2</sup> )	Normal ((18,5-24,9))	37 (76)
	Overweight (25-29,9)	12 (24)
Exercise training frequency	150-300 min/week	38 (77)
	300-600 min/week	11 (23)
Exercise training intensity <sup>a</sup>	Mild	11 (22)
	Moderate	38 (78)

<sup>a</sup>VO<sub>2</sub> max (also maximal oxygen consumption, maximal oxygen uptake, peak oxygen uptake or maximal aerobic capacity). Mild exercise training intensity (VO<sub>2</sub> max = 20-39 ml/Kg/min) and moderate exercise training intensity (VO<sub>2</sub> max = 40-59 ml/Kg/min).

Table 2: Total Softcup® complaints reported.

	Month 1		Month 2		Month 3		<i>p</i>
	Yes	No	Yes	No	Yes	No	
Easy insertion	41 (83,6%)	8 (16,4%)	43 (87,8%)	6 (12,2%)	44 (89,8%)	5 (10,2%)	0,5
Easy removal	31 (63,3%)	18 (36,7%)	34 (69,4%)	15 (30,6%)	37 (75,5%)	12 (24,5%)	0,4
Pain	6 (12,2%)	43 (87,8%)	4 (8,2%)	45 (91,8%)	4 (8,2%)	45 (91,8%)	0,5
Discomfort during sport	4 (8,2%)	45 (91,8%)	3 (6,1%)	46 (93,9%)	3 (6,1%)	46 (93,9%)	0,5
Leakage during sport	18 (37%)	31 (63%)	15 (31%)	34 (69%)	13 (27%)	36 (73%)	0,5
Cup loss during sport	4 (8,2%)	45 (91,8%)	3 (6,1%)	46 (93,9%)	3 (6,1%)	46 (93,9%)	0,5

## Figures

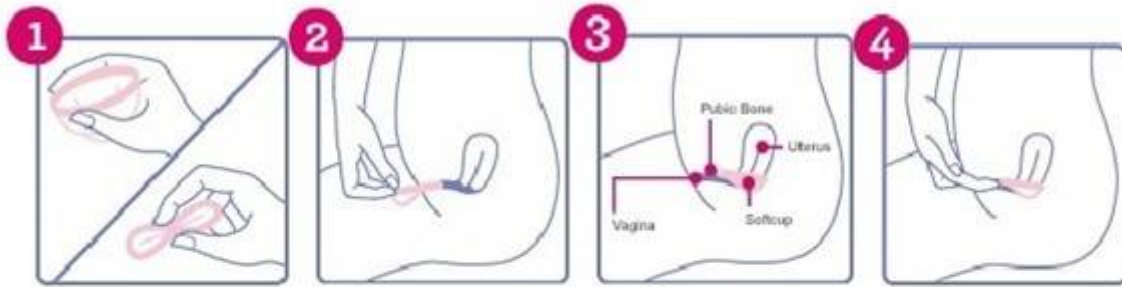
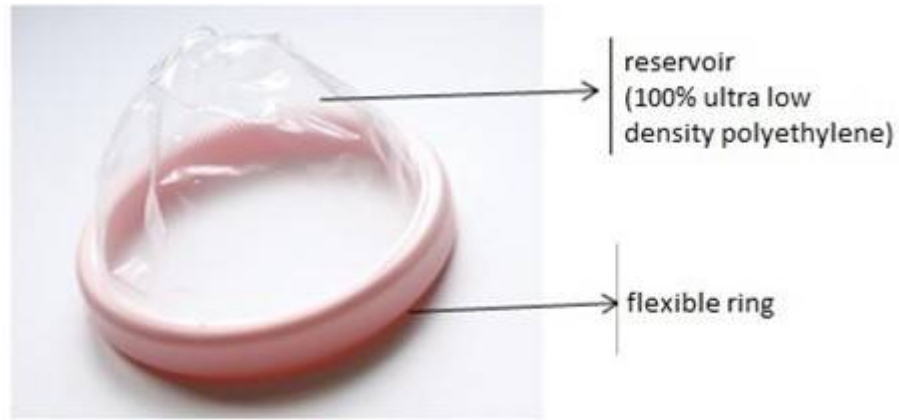


Figure 1: Softcup®: a simple single-size disposable over-the-counter menstrual cup that compresses to tampon shape to facilitate insertion and can be worn during coitus

## Figure 1

Figure 1: Softcup®: a single-size disposable menstrual cup that compresses to tampon shape to facilitate insertion and can be worn during coitus.

Table 1: Main sociodemographic and clinical characteristics of the analyzed athletes.

Variable	Parameter	No. (%)
Age	19-21	23 (47)
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## Figure 2

Table 1: Main sociodemographic and clinical characteristics of the analyzed athletes.

Table 2: Total Softcup® complaints reported.

	Month 1		Month 2		Month 3		<i>p</i>
	Yes	No	Yes	No	Yes	No	
Easy insertion	41 (83,6%)	8 (16,4%)	43 (87,8%)	6 (12,2%)	44 (89,8%)	5 (10,2%)	0,5
Easy removal	31 (63,3%)	18 (36,7%)	34 (69,4%)	15 (30,6%)	37 (75,5%)	12 (24,5%)	0,4
Pain	6 (12,2%)	43 (87,8%)	4 (8,2%)	45 (91,8%)	4 (8,2%)	45 (91,8%)	0,5
Discomfort during sport	4 (8,2%)	45 (91,8%)	3 (6,1%)	46 (93,9%)	3 (6,1%)	46 (93,9%)	0,5
Leakage during sport	18 (37%)	31 (63%)	15 (31%)	34 (69%)	13 (27%)	36 (73%)	0,5
Cup loss during sport	4 (8,2%)	45 (91,8%)	3 (6,1%)	46 (93,9%)	3 (6,1%)	46 (93,9%)	0,5

**Figure 3**

Table 2: Total Softcup® complaints reported.