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The condition of women frequently changing sanitary pads in 28 cities of China: a cross-sectional study

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Abstract

Objectives This study aims to fill the gap in understanding the frequency of changing sanitary pads and the key factors associated with this practice among women in China.

Methods Using a convenient sampling approach, a cross-sectional study was conducted with a quota sampling method to survey women from 28 cities in China between October 21 and 31, 2020. Basic demographic characteristics, personal hygiene habits, self-efficacy, health-related quality of life, and disease status were collected. Multiple logistic regression model was used to analyze the factors associated with the frequency of changing sanitary pads.

Results A total of 1682 respondents were included in this study. The condition of frequently changing sanitary pads was divided into three groups: "Not taken" (224 respondents, 13.32%), "Short-term taken" (330 respondents, 19.62%), and "Long-term taken" (1128 respondents, 67.06%). Multiple logistic analysis revealed that women who performed "long-term taken" cleaning up rubbish timely (OR = 22.89, P < 0.05), "long-term taken" regular breast self-examination (OR = 19.46, P < 0.05), "long-term taken" actively obtaining scientific contraception methods (OR = 7.40, P < 0.05), as well as those with higher health-related quality of life (OR = 33.72, P < 0.05), were more likely to perform "long-term taken" frequently changing sanitary pads. Conversely, women with chronic diseases (OR = 0.48, P < 0.05) and those aged 31–40 (OR = 0.44, P < 0.05) were less likely to perform the "long-term taken" frequently changing sanitary pads during menstruation.

Conclusions Most Chinese women practice good menstrual health management and frequently change their sanitary pads. However, there are still some women whose sanitary pad changing practices fall short of expectations. Multiple factors have been found to be associated with the frequency of changing sanitary pads. Based on the research results, healthcare institutions, schools, and the government can more effectively screen, assess, and support women who face menstrual health issues, thereby improving the overall level of menstrual hygiene management.

Keywords Changing sanitary pads, Menstrual hygiene, Menstruation, Cross-sectional study, China

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Introduction

Menstrual hygiene management is a critical aspect of women's health, with most women in modern society choosing to use sanitary pads during menstruation [1]. However, regular changing of sanitary pads is not just a recommendation but a necessity due to the rapid bacterial growth that can occur. Remarkably, bacteria can multiply up to 512 times in just three hours [2]. Studies show that after two hours of continuous use, the surface of sanitary pads can host up to 107 bacteria per square centimeter [3]. This rapid proliferation highlights the urgent need for proper menstrual hygiene practices. Therefore, timely and regular changing of sanitary pads, ideally every two to three hours, is essential to prevent health risks and ensure the well-being of women during their menstrual cycles. However, a 2016 survey in China found that 34% of 120 women wore sanitary pads for more than three hours during menstruation [2]. This practice is influenced by various factors, such as the preference for reusable menstrual pads or high-absorption sanitary pads to save money and reduce the frequency of changing pads [4], as well as the tendency to change pads less frequently if their menstrual flow is minimal [2]. Regardless of the menstrual flow, infrequent changing of sanitary pads can lead to reproductive tract infections, menstrual pain, anemia, and other health issues [5]. Therefore, frequent changing of sanitary pads is vital for maintaining menstrual health. However, studies on this topic in China have been limited by small sample sizes and narrow geographical scopes [2], lacking a large-scale survey that covers the entire country.

Several factors have been proven to be associated with women frequently changing sanitary pads in various countries. For example, a study in India found that women with lower quality of life, such as those with mobility disabilities, faced difficulties in changing sanitary pads promptly [6]. Research also indicates that women with good personal hygiene habits are more likely to prioritize menstrual hygiene [7, 8]. Consequently, we postulate that multiple factors may be associated with the frequency of sanitary pad changes among women. In this study, we include factors associated with health-related quality of life and personal hygiene habits to explore their association with the frequency of changing sanitary pads. Additionally, we consider the impact of chronic illnesses, which may pose economic and mobility challenges. Previous studies on menstrual hygiene management have primarily focused on low-income countries like Uganda and Niger, where inadequate sanitation systems contribute to poor menstrual hygiene [9]. However, due to recent enhancements by the Chinese government in the construction of sanitary facilities [10] and the improvement of the quality of sanitary pads [11], these situations are not applicable in China. Therefore, it is necessary to explore the frequency of changing sanitary pads and its associated factors in China.

Despite being classified as a low- and middle-income country by the World Bank in 2022 [12], China has made significant strides in women's health. In past decades, poor sanitation and unhygienic practices were prevalent, a common issue in many low- and middle-income countries [13, 14], including China [15]. Recognizing the crucial role of women's health in national development, China has prioritized women's healthcare, especially following comprehensive poverty alleviation in 2020 [16]. Middle schools have introduced health classes to raise awareness and improve menstrual practices among adolescent girls [17, 18]. Additionally, the Chinese State Council's 14th Five-Year Plan for National Health emphasizes strengthening women's health services and promoting reproductive health [19], underscoring the growing policy focus on menstrual health. Given these advancements, exploring the frequency of changing sanitary pads and its associated factors in China is both meaningful and significant. This research not only provides insights into the current state of menstrual hygiene in China but also offers valuable lessons that can be applied to improve women's menstrual health in low- and middle-income countries worldwide.

Material and methods

Study design

The study was conducted from October 21 to 31, 2020. The sampling process involved three stages. According to the traditional division criteria [20], all provinces, autonomous regions, and municipalities in China are divided into seven administrative regions (as shown in Additional file 1). First, we randomly chose two provincial administrative units from each of the seven administrative regions, totaling 14 regions. Secondly, from these regions, we used random number table to randomly select two cities each; we skipped this step for municipalities. Additionally, we directly included the capital city, Beijing, resulting in 28 cities. We then designed the age structure and ratio of urban and rural residents based on the seventh population census [21], using quota sampling. Finally, we used snowball sampling to collect family data. All respondents were asked to invite their immediate family members to complete the questionnaire together. Each family was given a unique identification number for use in the questionnaire.

To facilitate data collection, the questionnaire survey was distributed via Questionnaire Star, an online survey platform used in China. All investigators were trained in the questionnaire collection process to ensure data reliability and accuracy. They conducted one-on-one questionnaires distributions through the platform, allowing participants to access the survey by clicking a provided link to respond. Informed consent was obtained from all participants. If a participant had cognitive capabilities but struggled with filling out the questionnaire, the investigator conducted a one-on-one interview and filled out the responses on their behalf without suggestive words.

Study population

Ethical approval for the study was granted by the Key Research Base of Philosophy and Social Sciences in Shaanxi Province and Health Culture Research Center of Shaanxi (Number JKWH-2020-21). Informed consent was obtained from all participants, and all data were collected anonymously and kept confidential. The inclusion criteria for participants were: (1) having Chinese nationally; (2) voluntarily participating in this investigation and signing the informed consent form; (3) understanding the meaning of each question; (4) women aged 18 and over with menstruation. The exclusion criteria were: (1) respondents participating in other similar projects; (2) respondents who were unconscious or had a mental disorder.

Sample size calculation

We used the following method to calculate the sample size. The confidence interval was set to 95% and the margin of error accepted was set to 5%, which mean the $\alpha = 0.05$, $Z_{1-\alpha/2} = 1.96$. The precision (d) was set as 0.05. Based on data from a study [2], we used the expected incidence (p)=0.66. Taking into account an attrition rate of approximately 20%, the final minimum sample size was 431. In this study, we surveyed a total of 1732 women. The formula is as follow.

$$N = (Z_{1-\alpha/2})^{2} * p * (1-p) / d^{2}$$

Measurement

The questionnaires consisted of two parts: the self-made questionnaires and two standard questionnaires.

Self-made questionnaires

The self-made questionnaires included demographic characteristics and personal hygiene habits. Demographic characteristics included age, job characteristics, marital status, whether having chronic diseases, ethnicity, whether having religion, place of permanent residence, the highest qualification, and smoking and drinking status. Age categories were divided into three groups: "18–30", "31–40", and "41–50". Marital status was categorized as either "Unmarried" or "Married". Job characteristics were classified into "Sedentary" and "Other". Ethnicity was identified as "Han Chinese" or "Minorities". Religion was indicated as either "Yes" or "No". Permanent residence was categorized as "Rural" or "Urban". Smoking and drinking status were based on cigarette and alcohol consumption in the past 12 months, categorized as "Yes" or "No". The highest qualification was divided into "High school and below" and "College and above". Whether having chronic diseases included "Yes" and "No".

Personal hygiene habits included the condition of actively obtaining scientific health information, timely cleaning up rubbish, regular breast self-examination, actively obtaining scientific contraception methods, regular physical examination, self-health management, 2.5 h of exercise per week, and frequently changing sanitary pads during menstruation. Respondents could choose between "Not taken", "Short-term taken", and "Long-term taken" for these habits. Attitudes towards these behaviors were categorized into groups based on their intention and persistence: "Not taken" for those with no intention or decision to start, "Short-term taken" for behaviors persisted less than six months, and "Long-term taken" for behaviors persisted more than six months. Frequently changing sanitary pads was defined as changing pads at least every 2-3 h [3]. The standard of 2.5 h (150 min) of exercise per week was aligned with WHO's recommendation for 150-300 min of moderate-intensity aerobic activity or 75-150 min of vigorous-intensity activity, ensuring comparability and external validity [22, 23].

Standard questionnaires

EuroQol five dimensions questionnaire (EQ-5D) The EuroQol five dimensions questionnaire (EQ-5D) was used to measure health-related quality of life. Developed by the EuroQol Group in 2010, the EQ-5D consists of two parts [24]. Part 1 is a self-reported description of health problems [25], covering five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, with each dimension comprising one question [26]. Each dimension is scored on a 5-point Likert scale, ranging from "1=no problems" to "5=extreme problems". The Chinese version of health utility integrals system was used to convert these scores into the health utility value, which ranges from -0.391 to 1.000. Part 2 is the EuroQol visual analog scale (EQ-VAS), which represents participants' self-reported overall health perceptions [27]. The EQ-VAS score ranges from 0 to 100, with higher scores indicating a higher health-related quality of life. In this study, the Cronbach's α value for health-related guality of life was 0.913.

New general self-efficacy scale (NGSES) The new general self-efficacy scale (NGSES) was used to assess partici-

pants' perceptions of their overall competence [28]. The scale consists of 8 items, each scored on a 5-point Likert scale ranging from "1=strongly disagree" to "5=strongly agree", with higher scores indicating higher self-efficacy [29]. The summed scores on the NGSES range from 8 to 40 points. In this study, the Cronbach's α value for the NGSES was 0.958.

Statistical analysis

First, a descriptive statistical analysis was performed to analyze the characteristics of the included population. The Kolmogorov-Smirnov test was used to determine whether the continuous variables conformed to a normal distribution. The results showed that the continuous variables were non-normally distributed and were expressed using the median and interquartile range (IQR). Categorical variables were expressed as numbers and percentages. Second, the Wilcoxon two-sample and Kruskal–Wallis multiple-sample rank sum tests were used to assess the association between each univariate variable and the condition of frequently changing sanitary pads. Third, pairwise comparisons within the variables' subgroups were conducted using the Kruskal-Wallis multiple-sample rank sum test. Fourth, univariate logistic regression was employed to explore the association between women's health-related quality of life, selfefficacy, and frequently changing sanitary pads. Finally, multiple logistic regression analysis was used to identify the factors associated with the frequency of changing sanitary pads during menstruation, and the significant factors were presented in Table 5. In all analyses, a twotailed *P* value < 0.05 was considered as statistically significant. All statistical analyses were conducted using SPSS 26.0 (SPSS Inc., Chicago, IL, USA).

Quality control

Before the investigation began, two rounds of expert consultation and a pre-investigation were conducted to refine and improve the questionnaire based on the feedback received. Trained investigators distributed the link to the electronic questionnaire face-to-face to respondents using the Questionnaire Star platform (website: https:// www.wjx.cn), registering each questionnaire number individually. During the investigation, team members communicated with the investigators every Sunday evening to summarize, evaluate, and provide feedback on the collected questionnaires. After data collection, two researchers performed back-to-back logical checks and data screening. If an abnormal value was identified during data analysis, the original questionnaire was retrieved and verified with the investigator before proceeding with the analysis.

The exclusion criteria for selecting questionnaire were: (1) response time less than 90 s; (2) inconsistencies identified during logical checks; (3) incomplete questionnaires, defined as those with more than 10% missing independent variable data or any missing dependent variable data, which were directly excluded from the analysis.

Results

Characteristics of study participants

The survey contained 1732 questionnaires collected after removing 50 questionnaires due to data exclusion criteria totaling 1682 valid questionnaires, with an effective recovery rate of 97.11%. In the survey, the number of women aged 18-30, 31-40, and 41-50 were 985 (58.56%), 319 (18.97%), and 378 (22.47%), respectively. 13.50% of respondents had chronic diseases. Additionally, the "long-term taken" of cleaning up rubbish timely accounted for 1008 (59.93%), regular breast self-examination accounted for 623 (37.04%), and actively obtaining scientific contraception methods accounted for 839 (49.88%). Among the participants, the median of the quality of life score, overall health perception score, and self-efficacy score were 0.95, 89.00, and 32.00, respectively. The specific basic information and proportion of the subjects included in the study were listed in Table 1. Overall, we found that "Not taken" frequently changing sanitary pads accounted for 224 (13.32%), "Short-term taken" accounted for 330 (19.62%), and "Long-term taken" accounted for 1128 (67.06%). It indicated that most participants adhered to "long-term" frequently changing sanitary pads and their menstrual hygiene awareness was good.

Variable assignment

In the analysis, the assignment of categorical variables was shown in the Additional file 2.

Factors associated with the condition of frequently changing sanitary pads

As shown in Table 2, the condition of frequently changing sanitary pads during menstruation was used as the dependent variable, while age, ethnicity, marital status, and other characteristics were assigned as independent variables in the rank sum test model. The results showed that age, marital status, whether having chronic diseases, ethnicity, actively obtaining scientific health information, whether having religion, place of permanent residence, cleaning up rubbish timely, regular breast self-examination, actively obtaining scientific contraception methods, self-health management, and 2.5 h of exercise per week (P<0.05) were statistically significant but other variables were not.

Table 1	Basic characteristics of the stu	dy partic	pants, according	g to the condition	of frequentl	y changing sanitar	y pads ($n = 1682$)
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Variables	Infrequently changing (n)	Short-term frequently changing (n)	Long-term frequently changing (n)	Total (n)	Number of subgroups out of total percentage (%)
Age					
18–30	141	206	638	985	58.56
31–40	48	64	207	319	18.97
41–50	35	60	283	378	22.47
Job characteristics					
Sedentary	100	172	589	861	51.19
Other	124	158	539	821	48.81
Marital status					
Unmarried	139	198	606	943	56.06
Married	85	132	522	739	43.94
Whether having chronic diseases					
Yes	52	53	122	227	13.50
No	172	277	1006	1455	86.50
Ethnicity					
Han Chinese	193	297	1047	1537	91.38
Minorities	31	33	81	145	8.62
Actively obtaining scientific health information					
Not taken	156	146	326	628	37.34
Short-term taken	48	125	358	531	31.57
Long-term taken	20	59	444	523	31.09
Whether having religion					
No	203	304	1065	1572	93.46
Yes	21	26	63	110	6.54
Place of permanent residence					
Rural	58	77	211	346	20.57
Urban	166	253	917	1336	79.43
Cleaning up rubbish timely					
Not taken	148	58	57	263	15.64
Short-term taken	53	194	164	411	24.44
Long-term taken	23	78	907	1008	59.93
Highest qualification					
High School and below	48	60	230	338	20.10
College and above	176	270	898	1344	79.90
Smoking status					
Yes	7	4	15	26	1.55
No	217	326	1113	1656	98.45
Drinking status					
Yes	69	96	322	487	28.95
No	155	234	806	1195	71.05
Regular breast self-examination					
Not taken	181	117	291	589	35.02
Short-term taken	41	190	239	470	27.94
Long-term taken	2	23	598	623	37.04
Actively obtaining scientific contraception method	s				
Not taken	162	97	211	470	27.94
Short-term taken	47	192	134	373	22.18
Long-term taken	15	41	783	839	49.88
Regular physical examination					

Table 1 (continued)

Variables	Infrequently changing (n)	Short-term frequently changing (n)	Long-term frequently changing (n)	Total (n)	Number of subgroups out of total percentage (%)
Not taken	162	155	430	747	44.41
Short-term taken	55	146	224	425	25.27
Long-term taken	7	29	474	510	30.32
Self-health management					
Not taken	153	116	290	559	33.23
Short-term taken	65	180	300	545	32.40
Long-term taken	6	34	538	578	34.36
2.5 h of exercise per week					
Not taken	176	173	481	830	49.35
Short-term taken	42	134	330	506	30.08
Long-term taken	6	23	317	346	20.57

As a result of our rounding of decimal points, the sum of percentage of the items for cleaning up rubbish timely was above 100% and for self-health management was less than 100%

The variables of multiple samples were compared in the Table 3. There were statistically significant differences in the condition of frequently changing sanitary pads under different rubbish cleaning situations, actively obtaining scientific health information situations, regular breast self-examination situations, self-health management situations, and 2.5 h of exercise per week situations.

The association between health-related quality of life, overall health perception, self-efficacy and the condition of frequently changing sanitary pads were presented in Table 4. The result of this table showed that the health-related quality of life and self-efficacy had a significant association with women's condition of frequently changing sanitary pads during menstruation (P < 0.001).

Table 5 shows that the results of the subgroup analysis using multinomial logistic regression to predict factors associated with the condition of frequently changing sanitary pads.

In terms of daily habits, women who performed "longterm taken" cleaning up rubbish timely (OR=22.89, 95% CI 12.28, 42.66) were more willing to perform "longterm taken" frequently changing sanitary pads; in terms of health behavior, women who performed "long-term taken" regular breast self-examination (OR=19.46, 95% CI 4.38, 86.41) and performed actively obtaining scientific contraception methods (OR=7.40, 95% CI 3.66, 14.99) contributed to "long-term taken" frequently changing sanitary pads; in terms of living standards, women with higher health-related quality of life (OR=33.72, 95% CI 9.52, 119.46) were more willing to perform "long-term taken" frequently changing sanitary pads during menstruation.

However, the result showed that women aged 31-40 years old (OR=0.44, 95%CI 0.21, 0.94) and

women having chronic diseases (OR = 0.48, 95% CI 0.26, 0.88) were negatively associated with "long-term taken" frequently changing sanitary pads. Women with chronic diseases and aged 31–40 were unwilling to perform frequently changing sanitary pads during menstruation.

Discussion

In this study, we delved into the practice of frequently changing sanitary pads during menstruation and explored the associated factors. Our research highlighted that a significant number of women adhered to the practice of changing sanitary pads every 2–3 h, known as the "long-term taken" approach. Through our analysis, we uncovered compelling associations: women who maintained regular cleanliness, performed breast self-exams, and reported higher health-related quality of life were more likely to prioritize frequent pad changes. Conversely, women managing chronic diseases showed a tendency to change sanitary pads less frequently. These findings provide detailed insights into menstrual hygiene practices among Chinese women, shedding light on both protective and inhibiting factors. By identifying these factors, we pave the way for targeted interventions aimed at enhancing menstrual health management and promoting overall well-being.

Our study investigated how personal hygiene habits associated to the frequency of changing sanitary pads during menstruation. We found a strong association between practicing timely rubbish disposal, regularly conducting breast self-examinations, and actively obtaining scientific contraception methods with the tendency to changing sanitary pads frequently. Research suggests that women who maintain rigorous personal hygiene habits during menstrual bleeding, such as promptly disposing

Variables Average rank by group Wilcoxon two-sample/Kruskal-Wallis multiple-sample rank sum test Z/H Р Age 18-30 822.03 0.001 13.94 31-40 820.87 41-50 909.64 Job characteristics Sedentary 856.03 -1.51 0.130 Other 826.26 Marital status 817.15 0.005 Unmarried -2.80 Married 872.58 Whether having chronic diseases 717.84 < 0.001 Yes -4.97 No 860.79 Ethnicity Han Chinese 851.31 -3.25 0.001 Minorities 737.51 Actively obtaining scientific health information Not taken 699.12 157.73 < 0.001 Short-term taken 855.95 Long-term taken 997.79 Whether having religion 847.61 0.019 No -2.35 Yes 754.14 Place of permanent residence Rural 787.63 -2.79 0.005 855.45 Urban Cleaning up rubbish timely Not taken 391.62 668.21 < 0.001 644.67 Short-term taken Long-term taken 1039.13 Highest qualification High School and below 846.23 -0.24 0.809 840.31 College and above Smoking status No 843.16 -1.35 0.176 Yes 735.50 Drinking status 0.548 No 845.26 -0.60 Yes 832.26 Regular breast self-examination Not taken 664.55 Short-term taken 736.04 379.50 < 0.001 Long-term taken 1088.36 Actively obtaining scientific contraception methods Not taken 621.30 Short-term taken 616.49 514.39 < 0.001 Long-term taken 1064.89

Table 2 Rank sum test for the condition of frequently changing sanitary pads (n = 1682)

Table 2	(continued)
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Variables	Average rank by group	Wilcoxon two-sar Wallis multiple-sa test	nple/Kruskal– ample rank sum
		Z/H	Р
Regular physical examination			
Not taken	749.07		
Short-term taken	737.88	221.79	< 0.001
Long-term taken	1063.24		
Self-health management			
Not taken	691.88		
Short-term taken	757.75	278.64	< 0.001
Long-term taken	1065.17		
2.5 h of exercise per week			
Not taken	753.23		
Short-term taken	841.94	134.75	< 0.001
Long-term taken	1052.60		

of menstrual waste and maintaining regular bathing, prioritize hygiene to enhance physical comfort [7, 8] and reduce the risk of bacterial growth and infections [30]. This conscientious approach likely contributes to their frequent pad changes. Furthermore, the positive association observed between regular breast self-examinations, the active adoption of scientific contraception methods, and frequent pad changes indicated that women who prioritized these practices exhibited higher health awareness [31], a better understanding of their bodies [32], and overall healthier behaviors [33]. These comprehensive awareness and behaviors extended to menstrual hygiene practices [34], resulting in more frequent changes of sanitary pads. Ultimately, cultivating these habits not only supports immediate hygiene needs but also fosters longterm gynecological health.

In terms of health-related quality of life, our study found a positive association with the frequent changing of sanitary pads during menstruation. This finding supported the previous views that low health-related quality of life, such as inadequate water, sanitation, and hygiene facilities, posed significant challenges to women's menstrual health management [35–37]. Women facing challenges like impaired mobility or poor mental health often experienced diminished health-related quality of life [38], which negatively impacted their ability to manage menstrual hygiene effectively. Research indicated that women with mobility impairments may require assistance for changing pads or clothes, and delays in receiving this assistance can negatively impact their menstrual hygiene practices [39]. Therefore, understanding the interplay between health-related quality of life and menstrual hygiene is crucial for developing targeted interventions.

Regarding disease status, our study revealed that women with chronic diseases tended to change their sanitary pads less frequently. This behavior can be attributed to several interrelated factors. Chronic diseases often necessitated long-term and costly medical expenses [40], leading patients to reduce daily costs by using fewer sanitary pads [41]. The financial burden, combined with mobility challenges associated with some chronic conditions, discouraged frequent pad changes. Moreover, women living with chronic diseases generally experienced a lower quality of life [42], impacting their ability to maintain optimal menstrual hygiene practices. Conditions that caused joint pain or limit mobility, for example, can make frequent pad changes difficult and inconvenient [39], prompting these women to reduce their frequency. Understanding these dynamics is essential for developing targeted interventions that support women with chronic diseases in managing their menstrual hygiene effectively.

We also found that women aged 31–40 were less likely to change sanitary pads frequently compared to those aged 41–50. This phenomenon may be attributed to several factors. First, women typically experience menopause between the ages of 45–55 [43]. During the perimenopausal and menopausal stages, they may experience irregular menstruation [44], which may lead them to pay closer attention to their menstrual patterns. Moreover, some women in this age range may also experience heavier and more frequent menstrual cycles, necessitating more frequent changes of sanitary pads [45]. Additionally, women aged 31–40 are often at a critical stage in their careers or bear considerable family responsibilities [46], which may lead to less attention to or decreased frequency in changing sanitary pads.

Table 3 Comparison of pairwise rank sum tests for the condition of frequently changing sanitary pads (n = 1682)

Variables	Adjusted significance
Age	
А–В	1
В-С	0.011
A–C	0.001
Cleaning up rubbish timely	
А-В	< 0.001
В-С	< 0.001
A–C	< 0.001
Actively obtaining scientific health information	
А-В	< 0.001
В-С	< 0.001
A–C	< 0.001
Actively obtaining scientific contraception methods	
А–В	< 0.001
В-С	1
A–C	< 0.001
Regular physical examination	
A–B	< 0.001
B-C	1
A–C	< 0.001
Regular breast self-examination	
A–B	< 0.001
В-С	0.012
A–C	< 0.001
Self-health management	
A–B	< 0.001
В-С	0.02
A–C	< 0.001
2.5 h of exercise per week	
A–B	< 0.001
В-С	< 0.001
A–C	<0.001

For age group: A represented "18–30", B represented "31–40", C represented "41–50"; for cleaning up rubbish timely, 2.5 h of exercise per week, self-health management, regular breast self-examination, regular physical examination, actively obtaining scientific contraception methods, and actively obtaining scientific health information groups: A represented "Long-term taken", B represented "Short-term taken", C represented "Not taken".

Ensuring menstrual health is a critical imperative that requires coordinated efforts from both governmental initiatives and individual actions. Governmental strategies should prioritize promoting frequent sanitary pad changes through integrated menstrual hygiene education in school curriculums and robust public health campaigns. These initiatives should specifically target vulnerable groups identified through thorough community health surveys and socioeconomic analyses. Effective collaboration between policymakers and local healthcare providers is essential to distribute educational materials and sanitary products effectively across educational institutions, community centers, and healthcare facilities, particularly in marginalized areas like low-income and rural communities. Continuous monitoring and evaluation of hygiene practices through proactive health outreach programs will identify individuals with compromised health-related quality of life, enabling tailored interventions to address their specific needs. At the individual level, the practice of frequently changing sanitary pads is crucial for safeguarding women's health. Infrequent pad changes can create environments conducive to bacterial growth, increasing the risk of various health complications [47, 48]. Therefore, cultivating consistent daily hygiene habits and embracing proactive health behaviors are essential. These efforts not only promote the habit of changing sanitary pads frequently but also enhance overall menstrual health resilience [49].

There are still some limitations in this study. First, as a cross-sectional study, it cannot establish causal relationships between the frequency of changing sanitary pads and the associated factors, only associations. Second, the study's investigation of associated factors is limited. Future research should conduct more comprehensive and multi-faceted studies on these factors. Finally, as the data were self-reported, issues such as comprehension bias and recall bias may be present.

Conclusions

In conclusion, this cross-sectional study suggests that most Chinese women practice good menstrual health management and frequently change their sanitary pads. However, there are still some women whose sanitary

Table 4 The association between health-related quality of life, overall health perception, self-efficacy and the condition of frequently changing sanitary pads (n = 1682)

Variables	Conditio taken)	nitary pads: (Long-term				
	β	Р	OR (95%CI)	β	Р	OR (95%CI)
Health-related quality of life	1.71	< 0.001	5.50 (3.38–8.97)	4.97	< 0.001	175.58 (69.14–300.91)
Overall health perception	0.02	< 0.001	1.02 (1.02-1.03)	0.04	< 0.001	1.04 (1.03-1.05)
Self-efficacy	0.09	< 0.001	1.10 (1.07–1.12)	0.14	< 0.001	1.15 (1.13–1.17)

VariablesCondition of changing sanitary pads: (5hort-term taken)Condition of changing sanitary pads: (Long-term taken) \overline{B} Std.ErrorWald χ^2 value \overline{P} OR (95% Cl) \overline{B} Std.ErrorWald χ^2 value \overline{P} Cleaning up rubbish timelyReference: Not taken1470.2633.08<0.0014.332.53.714)1.330.2397.115<0.001Short-term taken1.470.2633.08<0.0015.182.74,981)3.130.3297.115<0.001Regular breast self-examinationReference: Not taken1.650.332.55.11<0.0015.182.74,981)3.130.3297.115<0.001Regular breast self-examinationReference: Not taken1.160.261.774<0.0015.182.74,981)3.130.3297.115<0.001Short-term taken1.160.261.774<0.0015.182.74,9671)2.970.777.270.007Long-term taken1.170.261.774<0.0012.771.64,466)0.280.740.230.001Contraception:Reference: Not taken1.170.271.4560.280.740.230.001Contraception:Reference: Not taken1.170.271.4560.280.290.0740.33Contraception:Reference: Not taken1.170.271.910.060.740.230.014Long-term taken1.120.271.456<						(
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Cleaning up rubbish timely Reference: Not taken Not taken Reference: Not taken Not Not taken Not		B	Std.Error	Wald χ^2 value	٩	OR (95% CI)	8	Std.Error	Wald χ^2 value	٩	OR (95% CI)
Short-term taken 147 0.26 33.08 < 0.001 4.33 (2.63, 7.14) 1.33 0.28 2.298 < 0.001 Long-term taken 165 0.33 25.51 < 0.001	Cleaning up rubbish timely	Referenc	ce: Not taken				Referenc	ce: Not taken			
	Short-term taken	1.47	0.26	33.08	< 0.001	4.33 (2.63, 7.14)	1.33	0.28	22.98	< 0.001	3.79 (2.20, 6.54)
Regular breast self-examination Reference: Not taken Reference: Not taken Not take	Long-term taken	1.65	0.33	25.51	< 0.001	5.18 (2.74, 9.81)	3.13	0.32	97.15	< 0.001	22.89 (12.28, 42.66)
Short-term taken 1.1 0.26 17.74 <0.001 301 (1.80, 5.00) 0.74 0.27 7.27 0.007 Long-term taken 1.75 0.78 4.98 0.026 5.75 (1.24, 26.71) 2.97 0.76 15.23 <0001	Regular breast self-examination	Referenc	ce: Not taken				Referenc	e: Not taken			
Long-term taken 1.75 0.78 4.98 0.026 5.75 (1.24, 26.71) 2.97 0.76 15.23 <0.001 Contraception: Reference: Not taken Reference: Not taken Reference: Not taken Reference: Not taken 0.028 0.038 0.332 Short-term taken 1.02 0.27 14.58 <0.001	Short-term taken	1.1	0.26	17.74	< 0.001	3.01 (1.80, 5.00)	0.74	0.27	7.27	0.007	2.09 (1.22, 3.58)
Contraception: Reference: Not taken Short-term taken 1.02 0.27 14.58 <0.001	Long-term taken	1.75	0.78	4.98	0.026	5.75 (1.24, 26.71)	2.97	0.76	15.23	< 0.001	19.46 (4.38, 86.41)
Short-term taken 1.02 0.27 14.58 <0.001 2.77 (1.64, 4.66) 0.28 0.28 0.94 0.332 Long-term taken 0.65 0.38 2.85 0.091 1.91 (0.90, 4.05) 2 0.36 0.301 Quality of life 0.52 0.49 1.17 0.279 1.69 (0.65, 4.37) 3.52 0.65 <<0.001	Contraception:	Referenc	ce: Not taken				Referenc	e: Not taken			
Long-term taken 0.65 0.38 2.85 0.091 1.91 (0.90, 4.05) 2 0.36 30.96 <0.001 Quality of life 0.52 0.49 1.17 0.279 1.69 (0.65, 4.37) 3.52 0.65 <0.001	Short-term taken	1.02	0.27	14.58	< 0.001	2.77 (1.64, 4.66)	0.28	0.28	0.94	0.332	1.31 (0.76, 2.30)
Quality of life 0.52 0.49 1.17 0.279 1.69 (0.65, 4.37) 3.52 0.65 29.72 <0.001 Age Reference: 41–50 Reference: 41–50 Reference: 41–50 0.04 0.836 31–40 -0.18 0.45 0.16 0.689 0.84 (0.35, 2.02) -0.1 0.48 0.836 31–40 -0.66 0.36 3.339 0.065 0.52 (0.26, 1.04) -0.82 0.33 0.033 Whether having chronic diseases Reference: no 1.71 0.10 0.60 (0.31, 0.04) 0.031 0.033	Long-term taken	0.65	0.38	2.85	0.091	1.91 (0.90, 4.05)	2	0.36	30.96	< 0.001	7.40 (3.66, 14.99)
Age Reference: 41–50 Reference: 41–50 18–30 -0.18 0.45 0.16 0.689 0.84 (0.35, 2.02) -0.1 0.48 0.836 31–40 -0.56 0.36 3.339 0.065 0.52 (0.26, 1.04) -0.82 0.33 0.033 Whether having chronic diseases Reference: no 1.71 0.101 0.66 (0.301, 201) -0.74 0.31 0.018	Quality of life	0.52	0.49	1.17	0.279	1.69 (0.65, 4.37)	3.52	0.65	29.72	< 0.001	33.72 (9.52, 119.46)
18–30 -0.18 0.45 0.16 0.689 0.84 (0.35, 2.02) -0.1 0.48 0.04 0.836 31–40 -0.66 0.36 3.39 0.065 0.52 (0.26, 1.04) -0.82 0.39 4.56 0.033 Whether having chronic diseases Reference: no 1.71 0.101 0.60 (0.36, 1.04) -0.74 0.31 5.56 0.04 0.04	Age	Referenc	ce: 41–50				Referenc	ce: 41–50			
31–40 -0.66 0.36 3.39 0.065 0.52 (0.26, 1.04) -0.82 0.39 4.56 0.033 Whether having chronic diseases Reference: no Reference: no 8 8 0.018	18–30	-0.18	0.45	0.16	0.689	0.84 (0.35, 2.02)	-0.1	0.48	0.04	0.836	0.91 (0.35–2.32)
Whether having chronic diseases Reference: no Xec	31-40	-0.66	0.36	3.39	0.065	0.52 (0.26, 1.04)	-0.82	0.39	4.56	0.033	0.44 (0.21, 0.94)
Vec27 0.20 1.71 0.101 0.60 (0.20 1.201 0.21 0.21 0.018	Whether having chronic diseases	Referenc	ce: no				Referenc	e: no			
	Yes	-0.37	0.29	1.71	0.191	0.69 (0.39, 1.20)	-0.74	0.31	5.56	0.018	0.48 (0.26, 0.88)

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pads changing practices fall out of expectations. Factors such as health-related quality of life, personal hygiene habits, and the presence of chronic diseases are associated with the frequency of changing sanitary pads. This study provides valuable insights for healthcare institutions, schools, and government, enabling them to more effectively screen, assess, and support women facing menstrual health issues, thereby improving the overall level of menstrual hygiene management.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12978-024-01910-1.

Additional file 1

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Author contributions

Jiachen Sun contributed to the data collection, data interpretation, and revision of the manuscript. Shuwen Bai contributed to the study's concept and design, statistical analysis and primarily to the writing and revision of the manuscript. Qi Li contributed to the study's concept and design, statistical analysis, and revision of the manuscript. Meizhen Zhao contributed to the revision of the manuscript. Lina Ge contributed to the study's design and revision. Shuang Zang contributed to the study's concept and design, statistical analysis, and revision of the manuscript. All authors reviewed and approved the final version and no other person made a substantial contribution to the paper.

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Data availability

The datasets generated during and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was granted by the Key Research Base of Philosophy and Social Sciences in Shaanxi Province and Health Culture Research Center of Shaanxi (Number JKWH-2020-21).

Competing interests

The authors declare no competing interests.

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