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Original Research Article

Knowledge, hygiene practices and health seeking behaviour for leucorrhoea among women university students

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ABSTRACT

Background: Leucorrhoea and its awareness, hygiene practices, symptomatology and health consciousness were evaluated among female students at Rama Devi Women's University. The survey aims to fill knowledge gaps, decrease stigmas and encourage early intervention to improve reproductive health outcomes.
Methods: A cross-sectional, web-based questionnaire survey (July 2024 - February 2025) among 356 female students of Rama Devi Women's University, Bhubaneswar included both qualitative and quantitative demographic data on menstrual hygiene practices, awareness, symptoms and health-seeking behaviour regarding leucorrhoea. Data were analysed using R software (V-4.3.3) for descriptive statistics, correlation analysis, Principal Component Analysis (PCA) along with word cloud generation to visually demonstrate themes from open-text responses.
Results: Among the 356 female students (ages 18-25), the majority were unmarried (98%) and from urban areas (68%). Approximately, 38% changed their menstrual products every 4-6 hours and 15% do it once a day. Leucorrhoea awareness was alarmingly low (10%) and 94% lacked formal diagnosis. Strong association (r=0.86) between junk food intake, poor sleep and leucorrhoea symptoms were observed, while poor menstrual hygiene was linked to abnormal discharge and itching. PCA identified clusters of poor hygiene, junk food consumption and low awareness of psychosomatic symptoms, while word cloud showed great interest in menstrual and reproductive health education.
Conclusions: This study highlights significant gaps in awareness and health-seeking behaviour relating leucorrhoea with young Indian women. Poor menstrual hygiene and unhealthy lifestyle practices were significantly associated with the incidence of symptoms, yet diagnosis was still very low. The findings indicate the immediate need for further educational strategies as well as stigma reduction. Evidence suggests that a multifaceted combination of awareness, hygiene promotion and early diagnosis is essential for improvements in the reproductive health outcomes.

Keywords: Leucorrhoea, Reproductive health, Health-seeking behaviour, Female students, Odisha

INTRODUCTION

Gynaecological disorders greatly affect the reproductive health and well-being of women, but these issues receive little insight and are especially neglected in developing countries like India.[1] Leucorrhoea, commonly referred to as pathological vaginal discharge, is one of the most reported gynaecological symptom, especially among adolescents and the reproductive aged population.[2,3] Despite being a common reproductive health concern across the world, it is frequently misdiagnosed and undertreated. One of the most significant impediments is persistent social stigma, economic constraints and most crucially, a lack of awareness amongst affected individuals.[4,5] Leucorrhoea mostly occur due to infection, inflammation, poor hygiene and hormonal imbalance or lifestyle factors.[6] However, in some cases, leucorrhoea may result in a more serious underlying infection known as vaginitis caused by *Trichomonas vaginalis,* which can lead to yellowish, frothy discharge with irritation and dysuria.[3] An important issue for adolescents is their poor understanding of reproductive health and hygiene

practices coupled with a lack of education. Studies estimate that approximately 75% of females have vaginal discharge at least once during their adolescent years, which illustrates the prominence of the condition at this stage of development. In addition, around 31.8% of them experience these symptoms on a regular basis, bringing to attention the prevalence and extent of reproductive health issues, if left untreated.[7,8] Vaginal discharge is essential in protecting reproductive health by facilitating lubrication, removing dead cells and preventing infection. On the other hand, pathological leucorrhoea can lead to discomfort, fatigue, social embarrassment and is commonly due to infections. If not addressed and treated, pathological leucorrhoea can lead to severe reproductive health conditions such as pelvic inflammatory disease and infertility. Timely scientific determinations and treatment is essential in conserving reproductive health.[9,10] Preventative strategies such as menstrual hygiene education, routine genital cleaning and awareness programming are important, especially for school- and college-aged females. However, there is a gap in understanding adolescent girls' knowledge, perceptions, and practices regarding Leucorrhoea.[2]

Several national and international studies reported serious consequences for menstrual health including hygiene practices, access to sanitary products or menstruation disorders. In-depth investigations from Odisha also highlight the awareness, limited resource availability and cultural taboos contributes maximally to the menstrual health landscape, particularly in rural and tribal contexts. Juang women in Keonjhar reported that 85% were using old clothes, while only 9% were using sanitary pads or cloth primarily due to cost concerns, lack of awareness and no market access.[11]

In another report, in Bhadrak, Koraput and Balangir districts of Odisha, 46% of people had no prior information regarding menstruation and only 61% used any sanitary pads.[12] Such findings reveal a clear need to improve awareness and health education particularly for leucorrhoea, which is commonly misunderstood and unknown to the individuals in Odisha. This study intends to examine young female's awareness, symptoms, hygiene practices and help-seeking behaviour for leucorrhoea to inform possible educational and preventative strategies in Rama Devi Women's University, Bhubaneswar, Odisha.

METHODS

Participants

The questionnaire survey on demographic characteristics, sleep status, menstrual status, treatment adaptability, knowledge and awareness about leucorrhoea etc. was carried out among female students of Rama Devi Women's University, Bhubaneswar. The aim of the survey was explained to the participants; responses were only obtained from those, who have given consent for participation in the survey. A total of 356 individuals all together responded to the different questions related to leucorrhoea and associated illness. The entire survey process including sampling technique, department selection and criteria for inclusion and exclusion of participants is indicated in Figure 1.

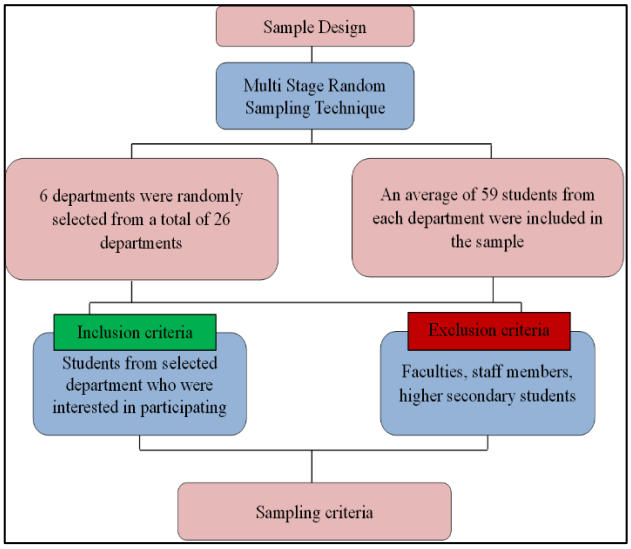

Figure 1: Sample designing procedure.

Questionnaire survey

The participants were asked to respond to web-based questionnaire. The questionnaire was divided into five key sections: Demographic Information, Lifestyle and Hygiene Practices, Medical History, Medical Consultation and Leucorrhoea Treatment and Awareness and Education. To collect complete information about reproductive health experience and behaviour the questionnaire used single-choice, multiple-choice and open-ended questions throughout its sections. The survey period was from 20th July 2024 to 19th February 2025 at Rama Devi Women's University, Bhubaneswar.

Participants in the poll were selected from a wide range of academic backgrounds, including undergraduate, post-graduate and doctorate degrees. In order to guarantee a wide and representative sample from a variety of academic and personal background, participation was encouraged from different departments. The survey's main goal was to investigate and comprehend significant facets of Women's reproductive health. The goal was to collect comprehensive data in six main areas: menstrual attitudes, menstrual assessment, leucorrhoea knowledge, personal experiences with leucorrhoea, treatment methods and personal suggestions.

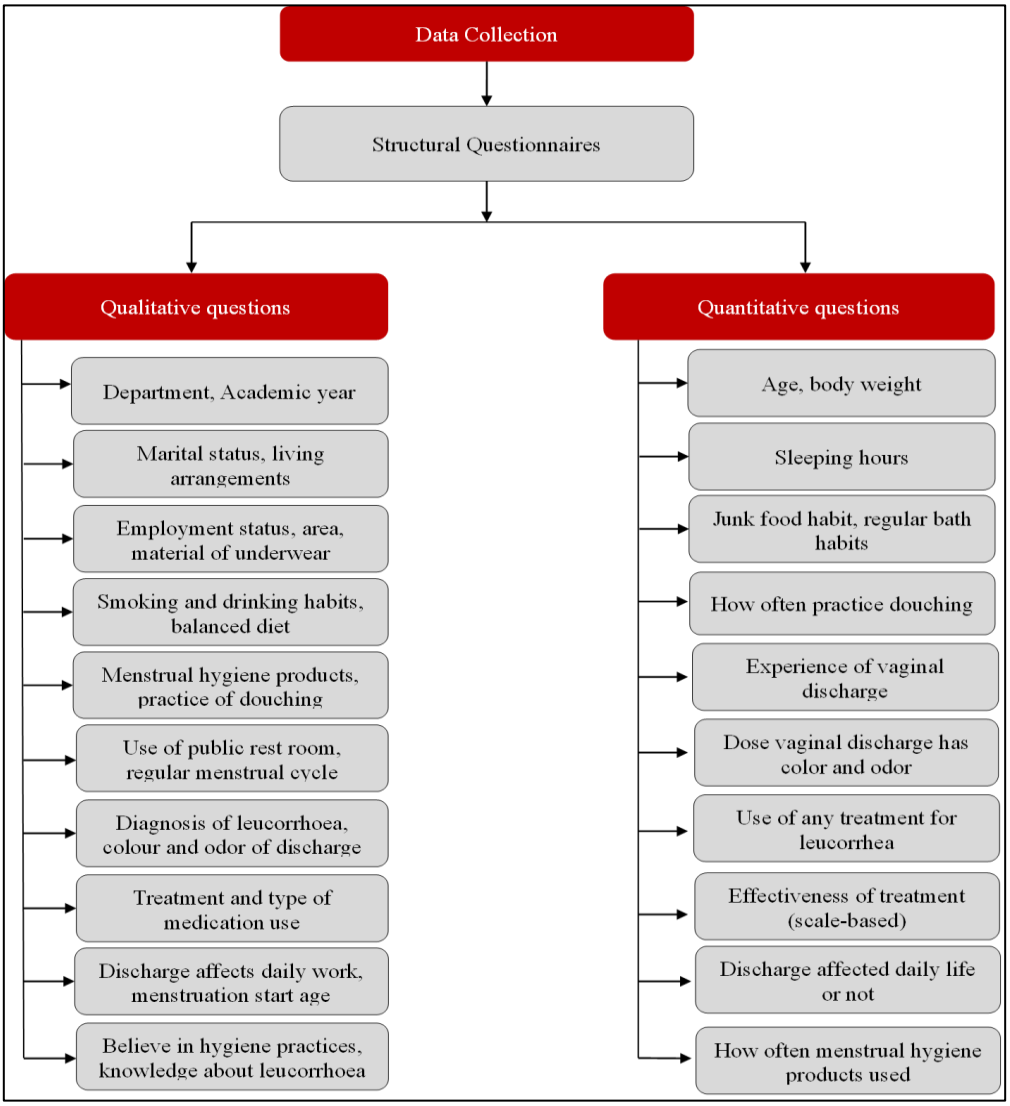

Figure 2: Overview of questionnaire for the survey.

Collection of quantitative data

A cross-sectional survey was conducted with the students of Rama Devi Women's University, Bhubaneswar through an online questionnaire on Google Form. The survey aimed to collect diverse information such as demographic features (age, body weight, academic year, sleep), menstrual practices (frequency of changing sanitary pads, and age at menarche) and the self-proclaimed confidence level in managing leucorrhoea along with lifestyle practices, physiological features and socioeconomic status (occupation, education, financial status).

All subsequent sections of the questionnaire assessed participant's understanding of leucorrhoea, patterns in sanitary product utilization and barriers experienced related to menstrual and vaginal health. The data obtained was systematically and statistically analysed for associations and possible predictors, providing understanding and context to the relationships between the respondent's demographic, lifestyle factors and the connected themes of reproductive health knowledge and experience.

Gathering of qualitative data

Alongside quantitative data, the web-based questionnaire included qualitative questions including questions on lifestyle patterns, personal habits and awareness of health that cannot be fully understood through quantitative analysis alone. This section included marital status, usage of public washrooms, substance use (smoking and alcohol), eating habits, menstrual cycle and vaginal discharge characteristics, all of which are important for reproductive health and awareness of leucorrhoea. The qualitative data provides extra context and enhanced understanding to the demographic data and portray a complete picture of menstrual health experiences.

Figure 2 depicts the integrated framework of the survey, outlining how both qualitative and quantitative components were organized for data collection. All the

qualitative and quantitative data were then statistically analysed to identify the correlations and factors contributing leucorrhoea, menstruation and vaginal health issues with the mixed-method approach, thereby enhancing the study's depth and relevance. Evaluating attitudes and receptive responses gave insight into the psychological and cultural barriers that persist, even in academic settings and assisted in getting past the superficial facts. These understandings are crucial for creating health education programmes that are not only informative but also promote discussion, lessen stigma and enable women to take charge of their health without feeling ashamed.

Data management and analysis

The collected data were analysed using methods provided by R programming software (version R-4.3.3). Descriptive visualizations were created to depict important characteristics of the data set. Different graphical methods of correlation analysis were also implemented to understand relationships between the variables in the study.

A correlation matrix (correlogram) was created to examine the relationships between the leucorrhoea symptoms and lifestyle factors (junk food consumption, sleeping time, age), whereas, correlation matrix and circular plots of correlation analysis were used to understand associations among variables such as experiencing leucorrhoea symptoms, the regularity of menstrual cycle, lack of consultation with medical practitioners, level of education and confidence level in identifying leucorrhoea. This investigation assisted in developing knowledge of how personal behaviour link and interact with leucorrhoea symptoms and its awareness. Additionally, Principal Component Analysis (PCA) was conducted considering six variables: symptomatology, regularity of menstrual cycles, symptoms of leucorrhoea, medical consultation, level of education and confidence in identifying leucorrhoea symptoms. To represent the frequency of significant phrases in participants' open-text descriptions of leucorrhoea, a word cloud was produced with Voyant tools, after being familiar with the participant's responses and initial interpretation. All the qualitative data were reviewed several times to ensure accuracy and thoroughness. Responses and words that are being repeated were systematically coded and put into different categories. The coding process helped facilitate the identification of key themes and contributions related to participant's understanding and experiences with leucorrhoea.

RESULTS

Results of individual parameters

The present survey based demographic study used random sampling method in order to assess several parameters such as lifestyle factors, dietary patterns, personal hygiene practices, sleep behaviour and awareness on reproductive health, with a specific focus on the prevalence and knowledge of leucorrhoea. The data were collected through a structured questionnaire by distributing among representative female students across various departments. In total, 356 female students participated, majorly between the ages 18-25 year.

Body weight data indicated that 228 (64%) of respondents were in the 40-60 kg range, while 100 (28%) were in the 60-80 kg range and around 11 (3%) in the 80-100 kg range, indicating that the majority of individuals were within a healthy weight range. When inquired about their marital status, 349 (98%) of them claimed they were unmarried, while the remainder were married, suggesting that the sample predominantly consisted of young single women.

Table 1: Correlation matrix analysis between junk food intake, sleep duration, age and leucorrhoea symptoms.

	Junk food intake	Sleep duration	Age	Leucorrhoea
Junk food intake	1.00000	-1.00000	1.00000	0.86602
Sleep duration	-1.00000	1.00000	-1.00000	-0.86602
Age	1.00000	-1.00000	1.00000	0.86602
Leucorrhoea	0.86602	-0.86602	0.86602	1.00000

(p values <0.05).

Table 2: Correlation matrix analysis (symptomatic, regular cycle, leucorrhoea, not consulted to doctor, educated and confidence regarding leucorrhea).

	Symptomatic	Regular cycle	Leucorrhoea	Not consulted	Educated	Confidence
Symptomatic	1.0000	-0.2491	0.09096	0.1141	0.0017	0.0623
Regular cycle	-0.2491	1.0000	-0.0213	0.0710	-0.0036	-0.02885
Leucorrhoea	0.0909	-0.0213	1.0000	0.2802	0.0809	-0.0219
Not consulted	0.1141	0.07108	0.2802	1.0000	0.0785	0.0817
Educated	0.0017	-0.0809	0.08091	0.0785	1.0000	0.1751
Confidence	0.0623	-0.0288	-0.0219	0.0817	0.1751	1.0000

In terms of their living situation, 146 (41%) respondents lived with family, 93 (26%) lived independently off campus and approximately 36 (10%) opted for "Other" implying they may have lived in some other type of accommodations like hostels or in shared living situations.

In regard to status of employment, 303 (85%) of respondents reported they were unemployed, 25 (7%) identified as "Others" (presumably freelancers or volunteers), 11 (3%) were working part-time, 7 (2%) were worked full-time and over 4 (1%) were self-employed.

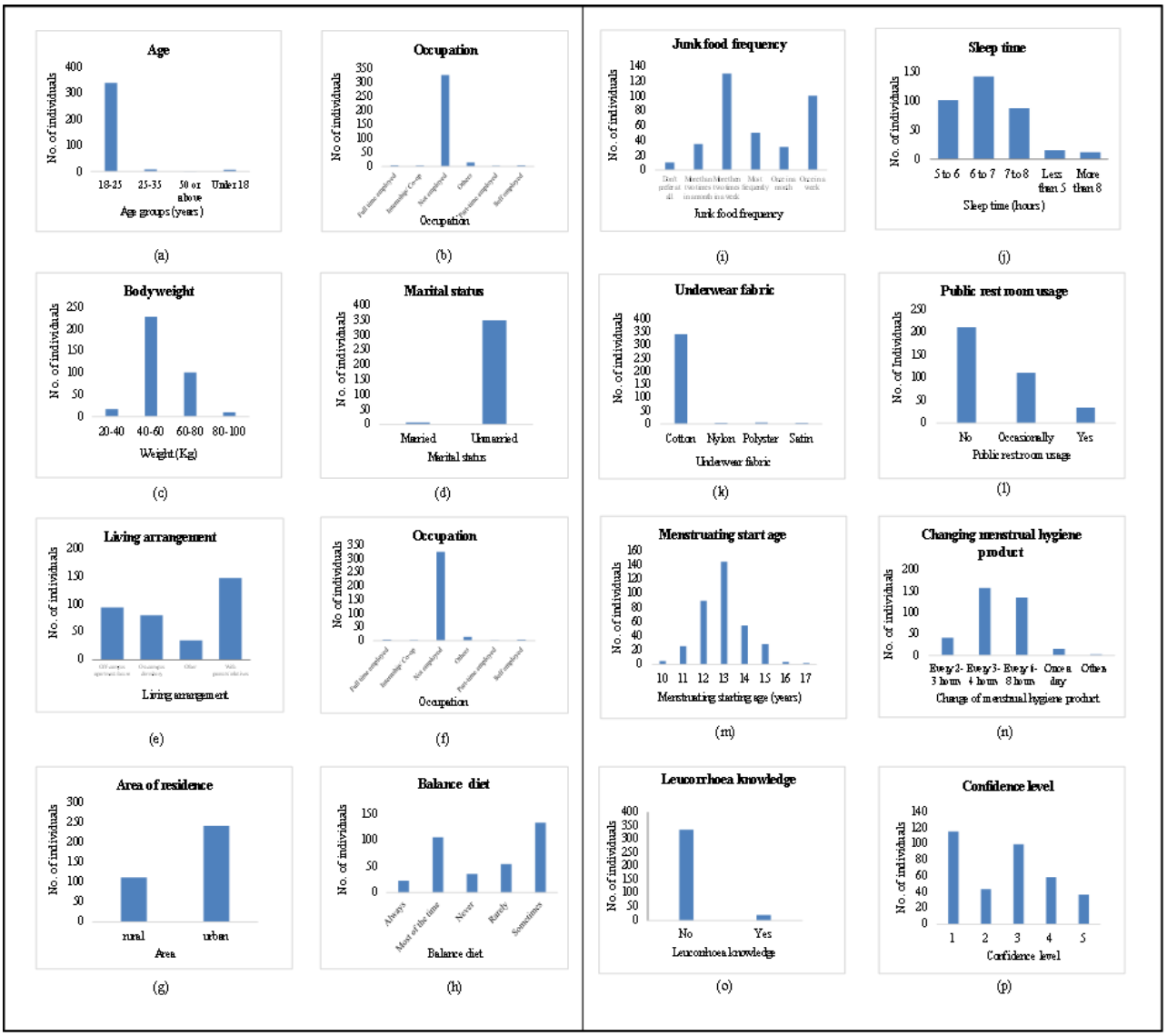

Figure 3: Key demographic, lifestyle, and health-related parameters among survey participants (n=356): (A) participants age, (B) occupations of the participants, (C) weight of the participants, (D) marital status, (E) living arrangements, (F) area of residence, (G) balanced diet, (H) frequency of junk food consumption, (I) sleep time, (K) fabric of underwear, (J) usage of public restroom, (K) menstruation start age, (I) change of menstrual hygiene product, (M) leucorrhoea knowledge among participants and (O) confidence level in identifying the symptoms of leucorrhoea.

This presents clear evidence that most of the participants were students in academia continuing higher education. In evaluating whether individuals reside in urban or rural settings, 242 (68%) of participants indicated residing in urban areas, while 114 (32%) in rural settings. The significance of this finding is that these geographic distinctions may have some bearing on differences in healthcare access and hygiene practices to assist healthier reproductive hygiene. Concerning dietary habits, 135 (38%) of participants indicated they occasionally consumed a balanced diet, 107 (30%) reported doing so most of the time, 53(15%) rarely adhered to a balanced diet and merely 25 (7%) consistently maintained a balanced diet, reflecting an inconsistent commitment to healthy eating and lifestyle. 132 (37%) indulged in junk food more than twice a week, 100 (28%) once a week, 50 (14%) regularly, whiles a smaller percentage consumed it either sometimes or abstained entirely. The high prevalence of

junk food consumption reflects an unhealthy tendency, necessitating attention in any therapeutic strategies. Sleep habit patterns indicated that 142 (40%) of respondents obtained 6-7 hours of sleep, 93 (26%) achieved 7-8 hours and 85 (24%) rested for 5-6 hours. Only 14 (4%) achieved 8 hours of sleep, while a minority slept for less, indicating that the participants typically did not attain the recommended 7-8 hours of sleep. A significant majority of 335 (94%) respondents preferred cotton underwear, whereas preferences for nylon, polyester and satin were less, indicating that most participants find cotton underwear comfortable and pleasant.

Regarding public restroom usage, 210 (59%) of respondents express a preference to avoid them, 110 (31%) indicate occasional use and merely 36 (10%) affirm regular usage; this suggests that numerous participants harbour concerns about cleanliness and personal hygiene. Regarding the onset of menstruation, 146 (41%) of participants experienced menarche at the age of 13 years, 93 (26%) at 12 years, while a significant number commenced it earlier or later, indicating a need for reproductive health education at an earlier age. According to data on menstruation hygiene, 135 (38%) of respondents changed their menstrual products every four to six hours, 43 (12%) every two to three hours and 160 (45%) every three to four hours. 53 (15%) of respondents changed once daily, the majority exhibited commendable cleanliness practices, but some need enhancement.

A limited understanding of leucorrhoea symptoms was evident; 117 (33%) of respondents reporting low confidence and only 36 (10%) reporting high confidence in knowing the symptoms well. This reveals a major educational need among the participants, which might assist raise knowledge and comprehension of leucorrhoea. Ultimately, 335 (94%) of participants reported no diagnosis of leucorrhoea, when around 21 (6%) had been diagnosed, indicating a probable under-diagnosis or lack of knowledge.

The survey results (Figure 3) reveal a distinct profile of young, predominantly single, urban women, who prioritize education and maintain a healthy weight. Additionally, they exhibit a tendency to utilize fewer public sanitation facilities, prioritize comfort and hygiene and prefer to modify their practices based on their comfort levels. Unfortunately, many of these young women, despite their educated background do not possess proper knowledge or awareness of leucorrhoea and its diagnosis. The accompanying social stigma and feelings of shame of seeking medical treatment also places their health at serious risks.

Correlational analysis between different parameters

Following data collection, correlational analysis was performed to identify possible causes and the parameters surrounding leucorrhoea. Two correlation graphs were produced such as circle plot interpretations and PCA using R programming language (version R-4.3.3).

The correlation matrix (Table 1) revealed that poor dietary habits, especially regular consumption of junk food, were moderately to strongly associate with reproductive health complaints such as irregular discharge, fatigue and a lack of menstrual regularity. Similarly, inadequate or disturbed sleep patterns were found to significantly correlate with reports of physical weakness and increased stress levels during menstruation.

One of the pivotal aspects of the study was menstrual hygiene. A notable proportion of participants reported infrequent changing of sanitary pads and lack of awareness regarding proper vaginal hygiene, such as the use of clean water and soap. These practices were strongly correlated with increased incidences of abnormal discharge and itching. Awareness regarding leucorrhoea was alarmingly low (Table 2, figure 4) with many respondents either unaware of the condition or harbouring misconceptions about its cause and treatment.

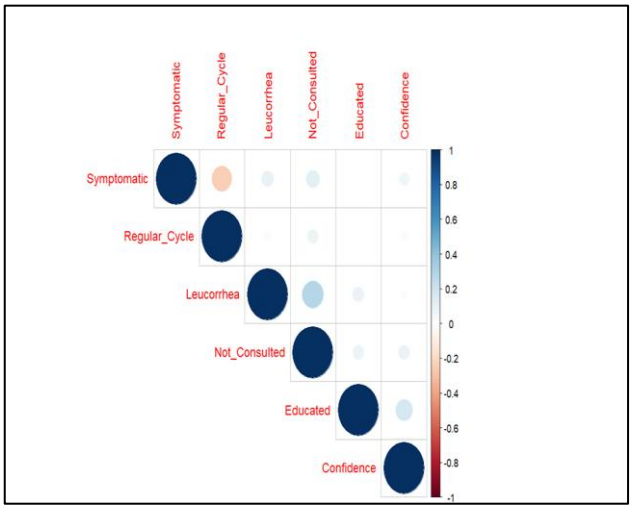

Figure 4: Correlation matrix and circle plot interpretation between parameters such as symptomatic, regular cycle, leucorrhoea symptoms, not consulted to doctor, educated and confidence in identifying leucorrhoea symptoms ($p \leq 0.05$).

In Figure 4, blue colour indicates a positive correlation, red colour indicates a negative correlation, and darker and larger circles represent a stronger correlation.

Principal Component Analysis (Figure 5) further supported these findings by grouping key variables into meaningful clusters. One component highlighted a link between poor hygiene practices, high junk food consumption and low awareness of reproductive health, while another grouped psychosomatic symptom such as fatigue, sleep disturbances and menstrual irregularity. These findings emphasize a multi-dimensional interaction between lifestyle choices and reproductive health.

Students who practiced healthier dietary habits, maintained better sleep routines and followed proper menstrual hygiene protocols exhibited fewer symptoms associated with reproductive tract infections. Furthermore, those who were informed about leucorrhoea and its prevention reported a higher sense of bodily autonomy and comfort during menstruation.

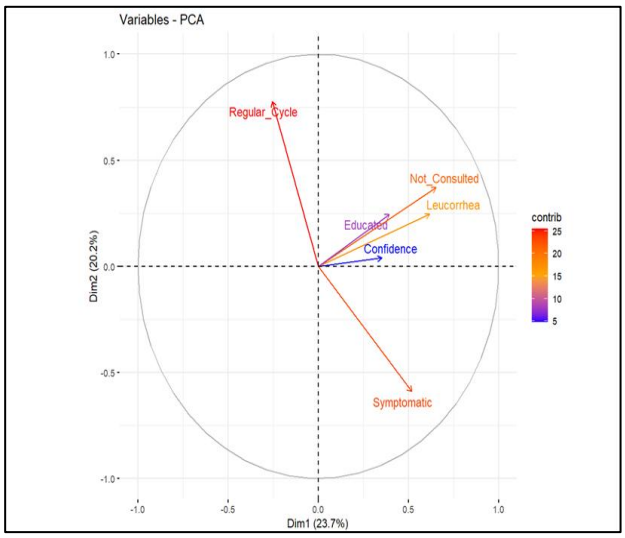

Figure 5: Principal component analysis (PCA) biplot illustrates the relationships between six parameters: symptomatic, regular cycle, leucorrhoea, not consulted to doctor, educated and confidence level in identifying leucorrhoea symptoms.

In Figure 5, dim1 (dimension 1) and dim2 (dimension 2) explain 23.7% and 20.2% of the variance, respectively. The arrows represent the direction and magnitude of each variable's contribution to the principal components. The colour gradient from blue to red indicates the level of contribution, with red representing the highest contribution.

DISCUSSION

Increasing knowledge and awareness of reproductive health is vital for addressing adolescent reproductive health challenges, especially in low-resource countries.[13] The results of this study highlight the significant lack of knowledge about leucorrhoea in young women, which could be detrimental to their overall development and health. Although the incidence of leucorrhoea is increasing, there is still a considerable lack of knowledge around its prevention and management strategies.[14] The current survey provides valuable information about adolescent women's lifestyle habits, menstrual hygiene practices and perceptions of reproductive health relevant to leucorrhoea. Although most of them were within normal healthy weight range and displayed satisfactory menstrual hygiene practices, individual dietary habits (with >65% or 231 participants frequently consuming junk food) and sleep patterns indicated risk of future health problems. This evidence is similar to that of studies in other Indian and developing countries, where educated youth continue to exhibit harmful behaviours to their reproductive health. Another study reported poor dietary and hygiene habits among adolescent girls contributes to leucorrhoea in women of South Kolkata region.[15] Although a majority of participants did change menstrual products regularly, 15% of participants reported changing only once a day; this was similar to gaps noted by a survey conducted at rural health unit and training centre, Singur, West Bengal.[16]

A particularly concerning finding is that the participants had limited awareness of the symptoms of leucorrhoea; only 36 (10%) were "very confident" in recognising symptoms of leucorrhoea and only 21 (6%) stated they had obtained a formal diagnosis of leucorrhoea, all of which signifies under-diagnosis and poor awareness. Studies from Yogyakarta stated that while all adolescents demonstrated good hygiene awareness, misconceptions surrounding leucorrhoea persisted and impacted adolescent's behaviour towards leucorrhoea and associated diseases.[17]

Importantly, the present study also highlights improper care, stigma and shame prevent many young women from accessing treatment, which is also acknowledged in recent reproductive health research assessed how specified health education with targeted interventions has found advantages in specifically improving women's knowledge and practices of reproductive health.[18]

Correlational and PCA analysis corroborate the complex implications of lifestyle, hygiene and awareness on reproductive health, especially leucorrhoea. Moderate to strong correlations were identified between junk food consumption and symptoms such as abnormal vaginal discharge, fatigue and irregular menstrual cycle. Moreover, sleeping inadequately was significantly associated with physical weakness and on-going stress during a menstrual cycle. These results are consistent with previous work; for instance, a national sample survey from Korea, which concluded that a short sleep duration (≤ 5 h) was associated with more severe menstrual disorders and disturbed sleep contributes to 46% increase in irregularities.[19]

Menstrual hygiene practices exhibited similarly striking patterns, as behaviours of suboptimal hygiene that included inadequate pad changing and not using clean water were found to be significantly correlated with both abnormal vaginal discharge and itching. These findings were consistent with existing literature demonstrating that poor menstrual hygiene is one of the main causes of reproductive tract infection in India and many other low-resource countries.[20,21] Additionally, leucorrhoea awareness was distressingly low, including lack of diagnosis and underreporting (only 21 participants or 6% reported a formal diagnosis). Other studies also confirmed low knowledge levels despite awareness of 'hygiene', indicates persistent gaps in education.[22] PCA analysis offered further validation of these associations by

grouping variables into clusters, one representing poor hygiene, unhealthy diet and low awareness of reproductive health; the other representing psychosomatic symptoms such as poor or no sleep and feeling tired. This multidimensional relationship is similar to a research that strongly correlates lifestyle factors (diet, sleep, hygiene) and reproductive health outcomes including dysmenorrhea, cycle irregularity and susceptibility to infections.[23,24]

This investigation establishes essential baseline information about female student's awareness and health behaviours concerning leucorrhoea at Rama Devi Women's University, Odisha. The research successfully discovered essential connections, which will direct upcoming longitudinal studies to examine reproductive health status across time. Despite its strengths, our study identifies three key limitations that may be addressed in future research to improve the credibility and depth of the findings. The survey utilized self-reported information to gain detailed personal information on this sensitive topic, yet upcoming studies need to incorporate clinical assessments for better differentiation between normal and abnormal cases of leucorrhoea. However, to achieve better generalizability, the single academic institution sample requires expansion into various socio-economic and rural populations. Additionally, the web survey enabled unrestricted participation, but future research may incorporate mixed method approach to help participants lacking internet access. Research findings suggested knowledge gaps, providing de-stigmatization and supporting healthy practices can help young women make informed decisions concerning their reproductive health through student-led workshops and professional-led interventions. Future educational programs need to focus on sustainable versions of education that can be incorporated into institutional health services and curricula.

CONCLUSION

Leucorrhoea is a common reproductive health issue, but it is not widely understood due to considerable misinformation, stigma, non-communication and restricted expressions surrounding leucorrhoea. The study with women participants of Rama Devi Women's University shows that although the majority of students were familiar with the term 'leucorrhoea', there were large gaps in knowledge regarding its causes, symptoms and consequences. Shame and stigmas serve as additional factors contributing to the reluctance in seeking medical consultation. As a result, education and awareness on leucorrhoea are urgently needed, especially through targeted school- and university-based awareness and education projects. Statistical techniques such as correlation and PCA demonstrated strong evidence of clear associations between negative behaviours (poor diet, sleep, insufficient menstrual hygiene) and leucorrhoea symptoms. These associations emphasize the need to view reproductive health in a holistic way including behavioural, psychosocial, and environmental factors. The results indicate a strong need for longitudinal and intervention research to better understand causal pathways, measure the longer-term effects of reproductive health education and to measure the relative value of peer-led models of reproductive health education or awareness-raising compared to more traditional professionally-led models. Thus, targeted educational interventions, supportive institutional environments and safe conversations are vital for young women to understand leucorrhoea, its implications, cause and management, and feel empowered in seeking medical advice. More importantly, as these students become more aware of their own health, they will be in a better position to share or promote health awareness with their friends or community, which will help to diminish the stigma and misinformation combined with leucorrhoea.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee (RDWU/IEC/02/2025)

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