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Relationship between Body Mass Index (BMI) and Menstrual Patterns among Nursing Students: A Cross-Sectional Study

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Abstract: Background: Menstrual disorders are common among young women and may be influenced by nutritional status and body mass index (BMI). Nursing students represent a relevant population because academic stress, hostel living, sleep disturbance, and dietary variation may influence menstrual health. **Methods:** This cross-sectional study included 301 female nursing students aged 19-25 years from KAHER Institute of Nursing Sciences, Belagavi. BMI was calculated from measured height and weight. Menstrual variables assessed using a structured questionnaire included age at menarche, dysmenorrhea, oligomenorrhea, menorrhagia, cycle regularity, inter-menstrual interval, menstrual flow, duration of flow, body aches, abdominal cramps, and irritability. Associations between BMI categories and menstrual variables were tested using chi-square analysis and multiple logistic regression. **Results:** Most participants had normal BMI (49.5%), while 36.5% were underweight and 14.0% were overweight. The most frequent menstrual complaints were abdominal cramps (81.4%), irritability (71.1%), body aches (69.8%), and dysmenorrhea (47.2%). Oligomenorrhea and menorrhagia were reported by 17.9% and 15.6% of participants, respectively. Across BMI categories, significant differences were observed for age at menarche ($p<0.01$) and menstrual flow ($p<0.05$), whereas most other menstrual variables did not show statistically significant associations. **Conclusion:** BMI alone was not consistently associated with most menstrual variables in this sample; however, underweight students reported a greater symptom burden and selected menstrual characteristics differed significantly across BMI groups. Nursing colleges should incorporate menstrual health screening, nutrition counselling, anaemia risk assessment, and referral pathways for students with persistent or severe symptoms.

Key Words: Body Mass Index, Menstrual Patterns, Nursing Students, Dysmenorrhea, Menstrual Flow, Student Health, Cross-Sectional Study

INTRODUCTION

Menstruation is a cyclical physiological process regulated by coordinated hypothalamic-pituitary-ovarian hormonal activity. Body mass index may influence menstrual function through altered estrogen production, insulin resistance, leptin signalling, stress-related neuroendocrine changes, and nutritional deficiency in underweight individuals [1-3].

Menstrual abnormalities such as dysmenorrhea, oligomenorrhea, menorrhagia, cycle irregularity, and associated somatic symptoms can affect academic performance, sleep, mood, and quality of life among young women. Previous studies have reported mixed findings regarding the relationship between BMI and menstrual patterns, with some demonstrating significant associations and others showing weak or inconsistent links [4-8].

Nursing students are an important group for study because irregular schedules, examination stress, hostel diet, sleep disturbance, and early clinical responsibilities may influence both BMI and menstrual health. Local data from Belagavi are limited, and better understanding of menstrual patterns in this population may help student health services identify under-recognised concerns [9-14].

The present study was therefore undertaken to estimate the prevalence of selected menstrual patterns among nursing students and to examine their relationship with BMI in a single-institution sample.

Objectives

- To describe the prevalence of selected menstrual patterns among nursing students

- To examine the association between BMI categories and menstrual variables including age at menarche, dysmenorrhea, oligomenorrhea, menorrhagia, cycle regularity, inter-menstrual interval, menstrual flow, duration of flow, body aches, abdominal cramps, and irritability
- To generate baseline data that may guide menstrual health screening, nutrition counselling, and referral support within nursing colleges

METHODS

Study Design and Setting

A cross-sectional survey was conducted at KAHER Institute of Nursing Sciences, Belagavi.

Participants and sampling: The study included 301 female nursing students selected by purposive sampling. Probability sampling was not feasible because data collection was conducted within a single teaching institute during the study period. The sample therefore represents an institutional cohort rather than a community-based population.

Inclusion criteria were willingness to participate and availability during data collection. Exclusion criteria included male students, age greater than 25 years, and self-reported medical disorders such as hypertension and diabetes mellitus. The manuscript acknowledges that additional menstrual confounders such as thyroid disorders, PCOS, anaemia, contraceptive use, and chronic stress were not comprehensively excluded and this remains a limitation.

Data Collection Tool

Data were collected using a structured questionnaire with two sections: socio-demographic data and menstrual pattern data. Height and weight were measured by the investigator and BMI was calculated as weight in kilograms divided by height in metres squared.

Operational Definitions

In this revised manuscript, oligomenorrhea is interpreted as infrequent menstruation, menorrhagia as heavy menstrual bleeding, regular cycle as a predictable cycle pattern as per questionnaire response, and menstrual flow as scanty, moderate, or heavy according to self-report. Because the original manuscript did not provide more detailed validated clinical cut-offs, findings should be interpreted as questionnaire-based self-reported menstrual characteristics rather than clinician-confirmed diagnoses.

Ethics and Privacy

Ethical clearance and written informed consent were obtained. Participants completed the questionnaire voluntarily, and confidentiality was maintained by analysing de-identified data. Because the topic was sensitive, privacy during questionnaire completion and the option to decline participation were emphasised.

Statistical Analysis

Data were summarised using frequencies and percentages. Associations between BMI categories and menstrual variables were assessed using chi-square tests, and multiple logistic regression was reported in the source manuscript. Statistical significance was considered at $p<0.05$. In this revised version, interpretation was aligned strictly with the reported tables, especially where significant p-values were present.

Because the original dataset and model output were not available for re-analysis, this revision corrects internal inconsistencies in narrative reporting but does not introduce new statistical results beyond those already present in the manuscript.

RESULTS

A total of 301 female nursing students participated. Most were aged 19-20 years (65.4%), belonged to nuclear families (83.4%), and had normal BMI (49.5%); 36.5% were underweight and 14.0% were overweight.

The commonest menstrual complaints were abdominal cramps (81.4%), irritability (71.1%), body aches (69.8%), and dysmenorrhea (47.2%). Oligomenorrhea and menorrhagia were reported by 17.9% and 15.6% of students, respectively. Most students reported regular cycles (85.7%), inter-menstrual interval of 21-35 days (65.8%), moderate menstrual flow (85.0%), and duration of flow of 3-5 days (71.1%) (Table 1).

Across BMI categories, significant associations were reported for age at menarche ($p<0.01$) and menstrual flow ($p<0.05$). Most other menstrual variables, including dysmenorrhea, oligomenorrhea, menorrhagia, cycle regularity, inter-menstrual interval, and duration of flow, were not statistically significant in the reported chi-square analysis.

The source manuscript narrative contained several reversals of Yes/No values and exercise frequencies. These have been corrected in the revised manuscript to match the tabulated results.

Table 1: Association of Menstrual and Clinical Variables with BMI Distribution

Variable	Category / Frequency	Key percentage	
BMI	Underweight / Normal / Overweight	36.5 / 49.5 / 14.0	Association with BMI
Age at menarche	14-15 years	50.5	Significant ($p<0.01$)
Dysmenorrhea	Yes	47.2	Not significant
Oligomenorrhea	Yes	17.9	Not significant
Menorrhagia	Yes	15.6	Not significant
Menstrual flow	Moderate	85.0	Significant ($p<0.05$)
Body aches	Yes	69.8	Not reported as significant
Abdominal cramps	Yes	81.4	Not reported as significant

DISCUSSION

The present study suggests that BMI was not uniformly associated with most menstrual variables in this institutional sample of nursing students, although significant differences were observed for age at menarche and menstrual flow. This indicates that BMI may influence selected menstrual characteristics without acting as a single explanatory factor for the broader spectrum of menstrual complaints [1,4,6,7,10-14].

A notable finding was the high proportion of underweight students (36.5%) and the frequent report of symptoms such as abdominal cramps, body aches, and irritability. In practice, menstrual symptoms in nursing students are likely influenced by multiple interacting factors including nutritional status, anaemia, stress, sleep disturbance, academic workload, and endocrine disorders such as thyroid dysfunction or PCOS [1,6,9,10,12,14].

The revised discussion therefore interprets BMI as one relevant factor rather than the sole determinant of menstrual health. The underweight subgroup may deserve particular attention from student health services because low BMI can coexist with inadequate nutrition, iron deficiency, and altered hypothalamic-pituitary-ovarian function [1,7,10,12,14].

This study should also be interpreted in light of methodological limitations. It was cross-sectional, single-centre, and based on purposive sampling. Menstrual variables were self-reported, the questionnaire description was limited, and several important confounders were not fully documented or excluded. Therefore, causal inferences cannot be made [6,10,11,14].

Despite these limitations, the study provides useful local baseline data and highlights the importance of menstrual health screening within nursing colleges. The main practical message is that students with recurrent heavy bleeding, severe pain, marked irregularity, or associated constitutional symptoms should be assessed more broadly rather than attributing symptoms to BMI alone [2,3,10,12].

CONCLUSION

In this study, BMI did not show a statistically significant association with most menstrual variables, although significant differences were observed for age at menarche and menstrual flow across BMI categories.

Underweight students formed a substantial proportion of the cohort and appeared to report a greater symptom burden, suggesting the need for nutritional counselling, anaemia screening, menstrual health education, and referral pathways for persistent or severe symptoms.

BMI should therefore be interpreted as one component of menstrual health assessment rather than an isolated explanatory factor. Nursing colleges should integrate menstrual history screening, diet counselling, stress and sleep guidance, and access to gynaecology referral when red-flag symptoms are identified.

Strengths and Limitations

Strengths of the study include a reasonable sample size for a single-centre survey, direct measurement of height and weight, and the inclusion of multiple menstrual variables.

Limitations include purposive sampling, single-institution setting, self-reported menstrual history, incomplete control for confounders such as PCOS, thyroid disease, anaemia, stress, and contraceptive use, and inconsistencies in the original narrative reporting that required correction during revision.

Ethics, Conflict of Interest, and Funding

Ethical clearance and written informed consent were obtained before data collection.

Participation was voluntary, confidentiality was maintained, and no conflict of interest or external funding was declared in the source manuscript.

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