**Nutraceuticals: A Potential Therapeutic Approach Using Natural Ingredients Towards Relieving Menstrual Pain among Young Bangladeshi Women**

.

ABSTRACT

|  |
| --- |
| **Introduction:** Nutraceuticals are substances considered as foods/parts of foods that provide medical and health benefits in terms of disease prevention and treatment. Nutraceutical is generally extracted from herbal products, matched with dietary supplements and diet-specific nutrients, and reduce dysmenorrhea and menstrual cramping. Asia has a profound history of using nutraceuticals for many remedies. Especially, Iranian ethnobotany and Chinese herbal medicine have been used for treating primary dysmenorrhea for centuries.**Objective:** To assess perceived knowledge, attitude and common practices among young women on using nutraceuticals as predefined food or herbs, assuming they are effective pain relievers during menstrual cramps.**Methods and materials:**This observational study explored the knowledge, attitudinal trend, and practice level (KAP) of nutraceuticals used by 130 randomly selected girls from 18-25 years old suffering from regular/recurrent menstrual pain. Data were randomly collected from four women's colleges in Dhaka city using a pre-tested close-ended questionnaire between November 2022 to January 2023, with written consent.**Data analysis plan:** Primary data were recorded, cross-checked, and entered into SPSS version 22. A *P*-value of <0.05 was considered statistically significant. **Results:** Of the 130 participants, most were between 21 and 26 years of age, and most (68.5%) were graduate. Among them, half (51.5%) had moderate, and 31.5% had severe menstrual cramping. There was no association between being overweight and having a menstrual cramp (p=0.63). Almost 30% (n=38) of participants reportedly took some herbal medicines and/or nutraceuticals to relieve their menstrual pain. While 36 strongly believed that taking herbal remedies in their primary dysmenorrhea gave them relief from pain than those who did not (p>0.001).**Conclusion:** The study found a plausible association between taking nutraceuticals during primary dysmenorrhea or menstrual cramping and getting better relief.  |

***Keywords:***Menstrual Cramping, Dysmenorrhea, Herbal Medicine, Nutraceuticals, Ginger, Chamomile,

1. INTRODUCTION

Nutraceuticals are natural bioactive supplements that offer nutritional benefits and potential treatments for various ailments. They include functional foods, medical foods, and dietary supplements like botanicals. These specifically formulated foods are rich in vitamins, minerals, proteins, and other nutrients to improve health and reduce the risk of chronic diseases [1] The main focus behind discovering nutraceuticals is to epitomize prevention, as stated by Greek physician Hippocrates, the father of medicine, who said, "Let food be your medicine". [2] When anybody accepts food that can give them health advantages, nourishment, and energy, it will fill in as a treatment for them. Nutraceutical and nutritional therapy theory's efficacy lies in detoxifying the body, avoiding vitamin and mineral depletion, and repairing healthy digestion and dietary habits. [3]

 The word dysmenorrhea originated from the Greek word dys, meaning difficult/painful/abnormal, men's meaning month and rrhoea, meaning flow. This medical term describes a tormenting uterine pain during menstruation. The pathophysiology of primary dysmenorrhea is likely a result of the cyclooxygenase pathway producing increased prostanoids, particularly prostaglandins (PGs). The increased PGs cause uterine contractions that restrict blood flow and lead to the production of anaerobic metabolites that stimulate pain receptors. [4] When this pain starts hampering regular activities and requires medication, then it's dysmenorrhea which is the most common gynecological problem among young women nowadays. More than half of the women in menstruating states are suffering from dysmenorrhea. [5]Usually, this pain arises between the first 20 years and after the age of 35. Dysmenorrhea typically appears among those women who lead a sedentary lifestyle with fewer social activities associated with affective symptoms such as headache, fatigue, nausea and vomiting, diarrhoea, irritability, chills, and muscle cramps.[6]

 Certain plants are used to treat dysmenorrhea and menstrual pain in Iranian traditional medicine and ethnobotany. Sumac (Rhus coriaria L.), savory (Satureja hortensis), pursuant to (Juniperus commonis), Tiger's Tail (Leonurus cardiaca), marjoram or oregano (Origanum vulgare), sage (Salvia sclarea L.), pennyroyal (Mentha longifolia), Ballota nigra, mountain ash (Sorbus boissieri), and nettle (Urtica dioica L.) are among the plants that are effective on menstruation and dysmenorrhea in the Arasbaran region of North West Iran. In the ethnobotany of Sīstān, located in the southeast of Iran, fennel (Foeniculum vulgare Mill.) is used to control the menstrual cycle [7]

Ginger (Zingiber), has been used for the treatment of nausea, vomiting, and diarrhoea, as well as pain associated with osteoarthritis, rheumatoid arthritis, migraines, and dysmenorrhea for at least 2,500 years. Ginger contains gingerol, gingerdiol, gingerdione, beta-carotene, capsaicin, and caffeic acid which provide anti-inflammatory, antioxidant and analgesic properties. [8,9] American Food and Drug Administration registered it as a herbal medicine [10] Chamomile (*Matricaria chamomilla*) contains Spiroether, a powerful antispasmodic agent that relaxes aching, relaxes the muscle, and reduces premenstrual torment. [11]Chamomile was compared with MA (Mefenamic Acid) for treating menstrual cramps. [12] Chamomile tea contains Apigenin, which helps reduce the impact of excitatory neurotransmitters and hormones on the mind and body, soothes the over-firing sympathetic nervous system, and helps modulate the actions of dopamine and serotonin, to offset the impact of depressive symptoms. [13]

 Mint has muscle relaxant, anti-inflammatory, and analgesic properties.[14] Thyme has anti-smooth muscle spasm properties and is conventionally used as a medical herb. The physiological effects of essential oils and tannins of cinnamon in folk medicine induce the energy sector, sedative, antispasmodic, and anti-inflammatory and are used to reduce menstrual pain [15]Tamarind has active ingredients such (as) antioxidants, anti-inflammatory, antipyretic, and tranquillizers [16]

 The nutraceuticals industry is growing rapidly, attracting health-conscious consumers from higher and upper-middle classes indulge in self-prescription practices. They view these products as a healthier alternative offering benefits with no side effects. [17]

The current knowledge regarding nutraceuticals provides a significant challenge for medical professionals, food technologists, nutritionists, and food chemists. To prevent and treat acute and chronic diseases caused by malnutrition and to promote good health, longevity, and quality of life public health authorities consider nutraceuticals as an effective method for sustaining health.[18]

**2. Objectives**

**2.1 General Objective:** To assess the perceived knowledge, attitudinal trends & common practices on nutraceuticals, and if these are effective against menstrual pain relief among young women of Bangladesh who follow/take nutraceuticals during menstrual cramping as food or herbs.

**2.2 Specific Objective:**

* To assess the age-specific perceived knowledge of taking nutraceuticals during menstruation among the study population.
* To determine their attitudinal trend on the use of nutraceuticals during pain.
* To explore their practice level on nutraceuticals (herbs or foods) during their menstrual pain to get relief.
* To understand the association of dietary habits with menstrual cramping.

3. Methods and materials

**3.1 Study Site:** Four girls' colleges in Dhaka city

**3.2 Study Design:** Observational study

**3.3 Study Period:** From November 2022 to January 2023

**3.4 Sample Size:** 130 respondents

**3.5 Sampling technique:** The Sample size was calculated using the n= pq(z2)/d2 formula. After their written consent, data was collected randomly using a pre-tested close-ended questionnaire.

**3.6 Inclusion Criteria:**

* Women from 18-25 years old
* Participants who were suffering from recurrent menstrual pain/cramping
* Living inside Dhaka city
* Participants who signed the written consent form

**3.7 Exclusion Criteria:**

* Women of <18 years and >25 years old,
* Participants who were not suffering from menstrual pain/cramping,
* Living outside Dhaka city
* Participants who didn't give written consent

**3.8 Variables**

**3.8.1 Dependent Variable**

* Menstrual pain relief

**3.8.2 Independent Variable**

* Age,
* BMI
* Education
* Nutraceutical knowledge
* Types of nutraceutical products consumption
* Dietary habit

**3.10 Data Analysis:** Collected data was edited and entered into an SPSS version 22. The data was analyzed using appropriate descriptive statistics and tabulated using frequency, percentage, mean and examined correlations between variables by *x2 -test.* Throughout the data analysis, a P-value <0.05 was considered statistically significant. Missing data were addressed by generating multiple datasets with estimated missing values and combining results

4. results and discussion

**Table 1: Demographic Status of Study Participants (n=130)**

|  |  |  |  |
| --- | --- | --- | --- |
| Demographic Characteristics |  | Frequency | Percentage (%) |
| Age (mean±SD, years) |  | 22.85±1.70 |  |
| Age (years) | 18-20 | 9 | 6.9% |
| 21-23 | 60 | 46.2% |
| 24-25 | 61 | 46.9% |
| Educational Status | Higher Secondary Certificate | 22 | 16.9% |
| Graduate | 89 | 68.5% |
| Post Graduate | 19 | 14.6% |
| Marital Status | Married | 14 | 10.8% |
| Unmarried | 116 | 89.2% |
| Anthropometric Measurement | Height (mean±SD, cm) | 158.5±5.09 |  |
| Weight (mean±SD, kg) | 53.67±8.53 |  |
| BMI (mean±SD, kg/m2 ) | 21.44±3.07 |  |

**Table 2: Attribution of Menstrual Recurrence and Changes in Cycle Patterns (n=130)**

|  |  |  |  |
| --- | --- | --- | --- |
| Outcome |  | Frequency | Percentage (%) |
| Menstruation Regularity | Yes | 116 | 89.2% |
| No | 14 | 10.8% |
| Menstruation Interval (mean±SD, days) |  | 30.12±7.9 |  |
| Usual length of menstruation (mean±SD, days) |  | 5.27±1.3 |  |
| Having twice or thrice menstrual cycles in one month | Yes | 30 | 23.1% |
| No | 100 | 76.9% |
|  | Never | 100 | 76.9% |
| Attributes of having twice or thrice menstruation | Once | 10 | 7.7% |
| 2-3 times | 15 | 11.5% |
| 4-5 times | 3 | 2.3% |
| More | 2 | 1.5% |
|  | 130 | 100% |

**Table 3: Intensity of Menstrual Pain (n=130)**

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes |  | Frequency | Percentage (%) |
| Pain Intensity | Mild | 22 | 16.9% |
| Moderate | 67 | 51.5% |
| Severe | 41 | 31.5% |

**Fig.1.The pie chart shows the timeframe of experiencing severe pain during menstruation (n=130)**

**Table 4: Association Between Painful Menstruation with BMI Range (n=130)**

|  |  |  |  |
| --- | --- | --- | --- |
| BMI | Having painful menstruation | Total | Chi-square test (P-value) |
| **Yes** | **No** |
| Underweight | 18 | 0 | 18 | *P*= 0.63 |
| Normal | 88 | 1 | 89 |
| Overweight | 21 | 1 | 22 |
| Obesity | 1 | 0 | 1 |
| Total | 128 | 2 | 130 |

**Table 5: Medication Usage for Pain Management and Side Effects (n=130)**

|  |  |  |  |
| --- | --- | --- | --- |
| Medicinal help | Yes | 55 | 42.3% |
| No | 75 | 57.7% |
| Medicinal Side-effect | Yes | 7 | 5.4% |
| No | 44 | 33.80% |
| Didn’t Take Medicine | 79 | 60.8% |

**Fig.2. The bar chart illustrates the participant's common sources of medical recommendations**

Fig.3. The pie chart represents the gap between having knowledge about nutraceuticals and being unaware of their effectiveness.

Table 6: Age Specific Consumption of Nutraceuticals (n=130)

|  |  |  |
| --- | --- | --- |
| **Age category** | **Consumption of Nutraceuticals** | **Total** |
| Yes | No |
| 18-20 | 3 | 6 | 9 |
| 21-23 | 18 | 42 | 60 |
| 24-25 | 17 | 44 | 61 |
| **Total** | 38 | 92 | 130 |

Fig.4. The bar diagram shows the common sources of recommendation the participants had for having some sort of nutraceuticals.

**Table 7: Association Between Taking Herbal Medicine and Menstrual Pain Relief (n=130)**

|  |  |  |  |
| --- | --- | --- | --- |
| Taking any herbal medicine or home remedy for pain relief | Pain relieved  | Total | Chi-square test (*P*-value) |
| **Yes** | **No** | *P*<0.001 |
|  Yes | 36 | 2 | 38 |
| No | 0 | 92 | 92 |
| Total | 36 | 94 | 130 |

**Fig.5. This chart shows the majority (74%) consumed nutraceuticals in liquid form. A smaller portion (16%) took them in their natural form after cleaning, and 10% preferred them as powder.**

**Table 8: Association Between Junk Food Eating and Menstrual Pain Intensity.**

|  |  |
| --- | --- |
| Junk Food Eating Frequency | The Level of Pain |
| **Mild** | **Moderate** | **Severe** | **Total** |
| Once in a week | 0 | 13 | 10 | 23 |
| 2-3 times in a week | 8 | 30 | 12 | 50 |
| 4-5 times in a week | 5 | 15 | 8 | 28 |
| Everyday | 2 | 6 | 6 | 14 |
| Total | 15 | 64 | 36 | 115 |

|  |
| --- |
|  |
| **Table 9: Association Between Junk Food Consumption and Menstrual Pain Severity.**

|  |  |  |  |
| --- | --- | --- | --- |
| Level of Pain | Junk Food Intake | Total |  Chi-square test (*P*-value) |
| **Yes** | **No** |
| Mild | 15 | 7 | 22 | *P*<0.02 |
| Moderate | 64 | 3 | 67 |
| Severe | 36 | 5 | 41 |
| Total | 115 | 15 | 130 |

 |

The knowledge of herbal medicine has been increasing in Bangladesh specially after COVID-19 pandemic which shifted the choice of medicine over non side effect herbal remedies nowadays. The choice has been making more by the young group of people. This study was aimed to identify that practice among who have been suffering from primary dysmenorrhea. The highest amount (46.9%) participants were from 24-25 years age category and 68.5% were graduates. The mean height was 158.5±5.09 and weight was 53.67±8.53, 89.2% were having regular menstruation and the menstrual interval was 30.12±7.9 days. Out of 130, 20 (15.3%) had twice or thrice menstruation in a month. According to the study criteria all (n=130) participants had menstrual cramp.

The study depicts that more than half (51.5%) of the participants had been suffering from moderate menstrual pain, while 31.5% claimed they experienced severe menstrual cramping. 61% of participants stated they had faced this pain in the 1st -2nd days of the period, 26.8% stated the 1st-3rd day of the period, and some (12.2%) told to face it the day before starting it to the 2nd day of menstruation. There was no association found between being overweight and having menstrual cramps (*p*=0.63).[19]

Around 42.3% of the respondents claimed that they took medicine to get relief from menstrual pain. Others had this recommendation to take medicine from their mother, sister, friends, and other relatives (25.45%, 9.1%, 14.5%, and 20%). It was noted that 5.4% of the respondents who took medicine for menstrual pain management subsequently faced certain side effects such as discontinuation of the period cycle, reduced blood flow, nausea, fatigue, late period cycle, and, more distressing, sometimes a gap of the cycle. [20- 23]

The present study identified that 24.60% had a mere idea about nutraceuticals or herbal medicine but about 29.20% participants used some sort of nutraceuticals for menstrual pain management. The maximum number of participants had taken nutraceuticals was in the age range of 21-23 years (n=18), followed by 24-25 years age category (n=17).

[24] The recommendation to use these products mostly (57.8%) they had from their mother and around 3/4th (74%) participants were having these ingredients as a liquid form such as; hot milk, hot water infused with ginger, salt, cinnamon, cardamom or clove powder, honey, bay leaf, lemon, green tea, ginger tea with black pepper, hot coffee. 16% of participants claimed that having black cumin, cardamom, cinnamon, clove, ginger as a whole product after cleaning gave them slight relief from menstrual pain and the rest (10%) took raw turmeric powder, ginger and cinnamon powder as an effective remedy. However, the study didn't conclude the exact percentage of taking each ingredient during menstrual pain, whereas in Iran, there was 64% improvement in severe pain with ginger, 66% with ibuprofen and 58% with mefenamic.[25]Even though the present study lacks to find out the exact benefit of different herbal remedies regarding menstrual pain, there was a significant (*P<0.001)* association found to get relief from primary dysmenorrhea pain after taking herbal remedies.[26] Their food habit played a significant role in having recurrent menstrual pain. As the study revealed, those who had eaten junk food (pasta, pizza, burgers, French fries, chicken fry, chips, cold drinks etc) at least once in a week were likely to have moderate to severe menstrual pain.[27] Subsequently, participants who were eating junk food 2-3 times (n=50) and 4-5 times in a week (n=28) suffered more from moderate to severe menstrual pain than others (*P=0.02*).[28]

 4. Conclusion

Natural cures, for example, ginger, honey, black cumin, *Ginkgo biloba*, honey bee dust, mint, chamomile, and so on have been utilized for menstrual pain management for hundreds of years in many countries. The study found a plausible association between taking nutraceuticals during dysmenorrhea or menstrual cramping to get better relief. The participants who had taken these natural remedies were mostly informed to be benefited from their pain management. Therefore, we assume nutraceuticals can be a potential solution to mitigate primary dysmenorrhea in some extent rather than taking other medicines that have decent side effects.

5. limitations of the study

* The study lacks to identify which ingredients gave them the highest benefit during menstrual pain.
* Clinical or medical test was not possible to prove the scientific authentication of preventive qualities of these nutraceuticals due to fund and proper lab facility limitations.
* The time was limited to conduct the in-depth interview with the participants.
1. **Future Scope of Nutraceuticals**

Education on nutraceuticals is essential, particularly for women and girls, to help them understand their role in disease prevention. Many everyday food elements act as nutraceuticals, and they can be beneficial in managing menstrual pain. Instead of relying solely on medication, women experiencing menstrual discomfort can consider natural remedies such as cinnamon, turmeric, ginger, herbal teas etc. which have shown muscle-relaxing properties. Additionally, for those who experience side effects from pain medications, herbal and homemade alternatives could serve as safer options. However, more scientific research and clinical trials are needed to validate these effects, enabling the food industry to develop targeted herbal products. The shift towards nutraceuticals also aligns with sustainability efforts, promoting natural health solutions over synthetic drugs.

**Ethical Approval:** The Government College of Applied Human Science, Azimpur, Dhaka, provided the authority to conduct the research, and ethical clearance was obtained from the Institutional Review Board (IRB) of Ad-din Women's Medical College.

**Consent:**

As per international standards or university standards, Participants’ written consent has been collected and preserved by the author(s).

1. **Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

References

* + - 1. Ragesh G, Karthikeyan L, Vallabhaneni K, Kayalvizhi R, Monisha J. A study on utilization pattern of nutraceuticals in pregnant women. Int J Nutr Diet 2017;5:1-10
1. Pharmsci EK-A, 2003 undefined. Nutraceutical-definition and introduction. Springer [Internet]. 2003 cited 2022 Sep 21];5(3):25. Available from: <https://link.springer.com/article/10.1208/ps050325>
2. Biotechnology JZ-R patents on, 2007 undefined. Nutraceuticals, nutritional therapy, phytonutrients, and phytotherapy for improvement of human health: a perspective on plant biotechnology application. ingentaconnect.com [Internet]. 2007 [cited 2022 Sep 21];1:75–97. Available from: <https://www.ingentaconnect.com/content/ben/biot/2007/00000001/00000001/art00006>
3. Ferries-Rowe E, Corey E, Archer JS. Primary Dysmenorrhea: Diagnosis and Therapy. Obstet Gynecol. 2020 Nov;136(5):1047-1058. doi: 10.1097/AOG.0000000000004096. PMID: 33030880.
4. Zaidi S, Khatoon K, Res KA-JAI, 2012 undefined. Role of herbal medicine in Ussuruttams (Dysmenorrhoea). researchgate.net [Internet]. 2012 [cited 2022 Sep 21];1(3):113
5. Bahmani M, Eftekhari Z, … MJ-J of C, 2015 undefined. Effect of Iranian herbal medicines in dysmenorrhea phytotherapy. eprints.skums.ac.ir [Internet]. 2015 [cited 2022 Sep 21]; Available from: http://eprints.skums.ac.ir/2034/
6. Kikuzaki H, Nakatani N: Cyclic diarylheptanoids from rhizomes ofZingiber officinale. Phytochemistry. 1996, 43: 273-277. 10.1016/0031-9422(96)00214-2
7. Schulick P: Ginger, common spice and wonder drug. 1996, Brattleboro (VT): Herbal Free Press Ltd, 3
8. M Iranmanesh, SH Najafi MY. No Title. J Herb Drugs J Herb Drugs. 2010;2:61–8.
9. Daily J, Zhang X, Kim D, Medicine SP-P, 2015 undefined. Efficacy of ginger for alleviating the symptoms of primary dysmenorrhea: a systematic review and meta-analysis of randomized clinical trials. academic.oup.com [Internet]. [cited 2022 Sep 21]; Available from: <https://academic.oup.com/painmedicine/article-abstract/16/12/2243/2460294>
10. Bhaskaran N, … SS-… journal of molecular, 2010 undefined. Chamomile: an anti-inflammatory agent inhibits inducible nitric oxide synthase expression by blocking RelA/p65 activity. spandidos-publications.com [Internet]. [cited 2022 Oct 11]; Available from: <https://www.spandidos-publications.com/ijmm/26/6/935>
11. Maleki-Saghooni N, … FK-A journal of, 2018 undefined. The effectiveness and safety of Iranian herbal medicines for treatment of premenstrual syndrome: A systematic review. ncbi.nlm.nih.gov [Internet]. [cited 2022 Oct 11]; Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5885324/>
12. Jang SH, Kim DI, Choi MS. Effects and treatment methods of acupuncture and herbal medicine for premenstrual syndrome/premenstrual dysphoric disorder: Systematic review. BMC Complement Altern Med. 2014 Jan 10;14.
13. Atta A, ethnopharmacology AA-J of, 1998 undefined. Anti-nociceptive and anti-inflammatory effects of some Jordanian medicinal plant extracts. Elsevier [Internet]. [cited 2022 Oct 11]; Available from: <https://www.sciencedirect.com/science/article/pii/S0378874197001372>
14. Bahmani M, Eftekhari Z, … MJ-J of C, 2015 undefined. Effect of Iranian herbal medicines in dysmenorrhea phytotherapy. eprints.skums.ac.ir [Internet]. 2015 [cited 2022 Sep 21]; Available from: <http://eprints.skums.ac.ir/2034/>
15. T. Widiatami, M. N. Widyawati, and A. Admini, “Study Literature Tentang Pemberian Minuman Kunyit Asam Terhadap Tingkat Nyeri Menstruasi Pada Remaja Putri [Literature Study for Curcumin Tamarind on Menstrual Pain Levels in Young Women],” Jurnal Kebidanan, vol. 8, no. 2, p. 139, 2018, doi: 10.31983/jkb.v8i2.3743.
16. Kulkarni, M., Dongre, P., Tadas, R. and Ahire, N. (2021) “Measuring Prescription Pattern of Nutraceuticals with Special Focus on Protein Supplements in Tier-1 Indian City”, Journal of Pharmaceutical Research International, 33(51B), pp. 78–84. doi: 10.9734/jpri/2021/v33i51B33515
17. Dureja H, Kaushik D, Kumar V. Indian Journal of Pharmacology 2003; 35: 363-372 Educational Forum Developments In Nutraceuticals.
18. Kaur K. 2014. Obesity and Dysmenorrhea in young girls: Is there any link? Human Biology Review, 3 (3), 214-225
19. T. Gagua, B. Tkeshelashvili, D. Gagua Primary dysmenorrhea: prevalence in adolescent population of Tbilisi, Georgia and risk factors,J Turk Ger Gynecol Assoc, 13 (3) (2012), p. 162, [10.5152/jtgga.2012.21](https://doi.org/10.5152/jtgga.2012.21)
20. K. O'Connell, A.R. Davis, C. Westhoff Self-treatment patterns among adolescent girls with dysmenorrhea J Pediatr Adolesc Gynecol, 19 (4) (2006 Aug 1), pp. 285-289, [10.1016/j.jpag.2006.05.004](https://doi.org/10.1016/j.jpag.2006.05.004)
21. M.I. Ortiz, Primary dysmenorrhea among Mexican university students: prevalence, impact and treatment, Eur J Obstet Gynecol Reprod Biol, 152 (1) (2010 Sep 1), pp. 73-77, [10.1016/j.ejogrb.2010.04.015](https://doi.org/10.1016/j.ejogrb.2010.04.015)
22. D.C. Potur, N.C. Bilgin, N. Komurc, Prevalence of dysmenorrhea in university students in Turkey: effect on daily activities and evaluation of different pain management methods Pain Manag Nurs, 15 (4) (2014 Dec 1), pp. 768-777, [10.1016/j.pmn.2013.07.012](https://doi.org/10.1016/j.pmn.2013.07.012)
23. Adhikari, Pharsuram & Yadav, Amod Kumar. (2024). PRESCRIPTION PATTERN OF NUTRACEUTICALS IN PATIENTS VISITING A TERTIARY CARE HOSPITAL, KATHMANDU, NEPAL. Innovare Journal of Medical Sciences. 12. 7-10. 10.22159/ijms.2024v12i3.50672.
24. G Azgoli, M Goli, F Moatar, N Velaei. Research in Medicine, 2007, 31 (1), 65-61.
25. M Modares, M Mir-Mohammadali, Z Ashrieh, E Mehran. Journal of Medical Sciences Babol, 2011, 13 (3): 58- 50
26. Anderson, B., Rafferty, A. P., Lyon-Callo, S., Fussman, C., Imes, G., & Kviz, F. J. (2020). Fast-food consumption and obesity among Michigan adults. Preventing Chronic Disease, 4(3), A68.
27. Lee, C., & Williams, A. (2022). Frequency of junk food consumption and its relation to menstrual cycle length and pain. Women's Health Issues., 32(1), 25-32.