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Awareness Among Adolescent Girls in Gurugram on Nutritional, Menstrual, Hormonal Health and Female Cancers : A Step toward Evidence-Based Public Health Reform

Saesha Rawal

Grade XII IBDP, Scottish High International School Gurugram, India

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ABSTRACT

This study suggests that it is extremely important for adolescent girls to recognise, understand, and be aware of signs and symptoms of menstrual irregularities to maintain their reproductive health, prevent occurrence of hormonal imbalance ailments like PCOS, and decrease the risk of infertility and female cancers. The aim of this study is to build a community-based dataset on adolescent girls in Gurgaon regarding awareness and symptom duration, identifying barriers to preventive gynaecological care and providing evidence to push for curriculum changes and school-based screening initiatives. Existing knowledge and studies confirm a strong biological link between menstrual disorders and female cancers like breast and uterine cancer and link between lifestyle, nutrition, hormonal imbalance with PCOS and ovarian cancer. This study contributes to extant research by providing an overview of how much adolescent girls in India understand this link, how early they experience symptoms, and why they do or don't seek help. Research data suggests that while a majority of the sampled population had reported menstrual irregularities, very few were aware of the long-term consequences on their future health. Thus, based on these detailed findings, this research recommends the inclusion of mandatory biannual consultation of adolescent girls in high school from 9th to 12th grade with an adolescent gynaecologist and inclusion of information on menstrual, hormonal and reproductive health and female cancers in school curriculum.

Keywords: Adolescents, Menstrual health,PCOS,Female cancers ,Gynaecologist

1. Introduction

India has the largest adolescent population in the world with 80 million teenage girls. [1]. Adolescent girls comprises individuals in a transient phase of life, moving from puberty to adulthood, and require nutrition, education, counselling and guidance to ensure their

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development into healthy economically productive adults. The health of this group forms a critical foundation for the wellbeing and future of any nation. Enhancing awareness among adolescent girls about menstrual, reproductive, and sexual health can yield significant long-term benefits, including the prevention of hormonal imbalance disorders such as PCOS, reducing infertility, and lowering the risk of female cancers. This study is significant as it identifies adolescent girls as a vulnerable group requiring early intervention through targeted education and awareness programmes. Emerging literature highlights that menstrual cycle characteristics serve as important markers of women's overall health across the life course, with growing evidence linking menstrual irregularities to heightened risks of female cancers [2,3,4,5]

Over the past few decades, cancer has emerged as a pressing public health challenge in India, reflected not only in its rising incidence but also in the pronounced gender disparities in cancer burden, with breast and cervical cancers ranking among the most prevalent. Among Indian women, breast cancer accounts for nearly 30% of new cases and more than 24% of cancer-related deaths. Cervical cancer follows closely, with over19% of new cases and almost 20% of deaths. While the incidence of cancer generally increases with age, particularly among those aged 70 years and above, it is striking that women in the reproductive age group (15-49 years) also bear a considerable burden and contributes to nearly 20% of cancer deaths, underscoring the significant health risks faced by women during their prime years.

Ovarian cancer, often referred to as a *"silent killer,"* remains one of the most formidable health challenges facing women in India today. Ranking as the third most common cause of cancer among Indian women, it affects approximately 6.8 women per 100,000 annually translating to around 25,000 new cases each year. Despite this growing number, public awareness remains alarmingly low, largely due to the disease's ability to develop with minimal or no symptoms in its early stages. What makes ovarian cancer especially dangerous is its tendency to go undetected until the advanced stage, where treatment becomes significantly more complex and less effective. This silent progression not only threatens the lives of thousands of women but also places a heavy financial burden on families and the healthcare system. The surge of cancer incidence in India, especially in women, requires immediate attention with defined strategies for early awareness and early detection, and the availability of treatment for all. As Dr Foulkes, Executive Director of Research and Innovation at Cancer Research UK, so succinctly states: "Timing is everything when you're treating cancer." Timely intervention can significantly impact cancer survival rates, potentially saving millions of lives in the years ahead. It is important to address gender differences and age patterns in order to frame more effective healthcare policies [5,6,7,8,9,10,11,12].

While other studies have evaluated the prevalence of menstrual health irregularities amongst adolescent girls, this study focuses on investigating awareness about the menstrual health,

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reproductive health, and long-term health risks like cancers, while also examining their fear, apprehensions, dietary patterns and socio-cultural backgrounds. It aims to contextualise their experiences in order to suggest the integration of mandatory gynecological care early in life, beginning at the high school level, through biannual check-ups and consultations. Such measures would normalize gynecological visits as a routine health practice, free from taboo or shame, and encourage continuity into adulthood.This research intends to break the silence surrounding menstruation and reproductive health in India by fostering knowledge, awareness, and empowerment. It emphasizes the importance of non-judgmental, empathetic, and respectful gynecological care, enabling adolescent girls to better understand the links between menstrual and reproductive health and female cancers. At present, misinformation, often spread through social media information and reinforced by peer influences, shapes nutritional choices and lifestyles behaviors during adolescence, leaving lasting negative impacts on future health. By embedding knowledge empowerment and confidential, stigma-free gynecological access into school health programs, this study aims to instill confidence, promote timely awareness of female cancers and hormonal disorders, and ultimately support adolescent girls in building healthier, more secure futures

2. Review of Literature

2.1 Adolescence Girls & importance of Health

India has the largest adolescent population in the world, 253 million, and every fifth person is between 10 to 19 years (1). Adolescent girls account for nearly 10% of India's total population and represent about one-fifth of the female population.Globally, this group faces a wide spectrum of gynecological problems among which menstrual disturbances account for nearly 75%.

Adolescence forms a critical phase of transition where youngsters undergo physical and physiological changes; among girls, this includes the menarche, the onset of menstruation, which is considered the most pivotal milestone [2,3]. With an estimated one billion adolescents worldwide, adolescent reproductive health has become a major global public health priority and important component of global health. Safeguarding the health of adolescent girls is especially crucial in India, as they represent future mothers and caregivers whose health directly impacts subsequent generations. Equipping them with knowledge and healthcare access not only promotes their well-being but also strengthens national economic and health outcomes [3,4].

At present, adolescent health programmes in India are fragmentary and predominantly generic in nature. Existing programs tend to combine health issues of boys and girls and focus on broad themes such as sexual health, sexually transmitted infections, nutrition, substance abuse, and

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mental health, without adequately addressing adolescent girls' specific needs related to menstrual irregularities, hormonal imbalances, and their potential links to female cancers [1]. For example, there are no prescriptions stating the need for periodic gynaecological visits or even annual medical check-ups. At present, menstrual hygiene programs primarily target adolescent girls in rural areas, supplemented by free distribution of sanitary napkins, especially among economically weaker sections. There is a significant gap in comprehensive reproductive health education and services tailored to urban and general populations of adolescent girls in India. Addressing these gaps is critical as adolescence is a window of opportunity to influence lifelong health trajectories for the young females.

2.2 Menstrual Health

Menstruation though a natural process, but in India it often carries stigma and silence with taboos and myths leading to shame and isolation; this impedes both - seeking gynecology care and access to very useful information and support required during adolescence to preserve emotional, hormonal, mental, and physical health. An observational study by gynaecologists on menstruation and related disorders in Indian adolescent girls group observed that 55% girls had dysmenorrhea, 65% had irregular menses, 52% oligomenorrhoea, 13% polymenorrhoea, 28% had menorrhagia, 2% amenorrhea, 10% with PCOS and 2% with endometriosis, 4% with hypothyroidism, 4% with hyperprolactinemia. The study reported that most of the girls responded well to treatment and suggested that menstrual irregularity needs to be evaluated with utmost sensitivity and treated promptly;lack of sufficient knowledge, awareness regarding menstruation among adolescent girls and social embarrassment should be tackled with education. [13]. There are several menstrual health issues among adolescent girls which includes irregular menstrual cycles, menstrual cramps or dysmenorrhoea, Premenstrual syndrome,excessive bleeding or menorrhagia and even amenorrhoea or stoppage of menstrual cycles caused by hormonal imbalances, stress, excessive exercise, inadequate nutrition or underlying health conditions which may be accompanied by symptoms such as nausea, fatigue, and headache, mood swings, bloating, breast tenderness, and food cravings and even less haemoglobin or anaemia if not managed properly. Infections resulting from poor menstrual hygiene, such as bacterial vaginosis, yeast infections, or urinary tract infections, can lead to more serious complications like pelvic inflammatory disease (PID), infertility, or systemic infections if not treated promptly and hygienically [14,15]. Menstrual problems can also have a significant impact on mental health, leading to increased stress, anxiety, depression, and low self-esteem if girls feel ashamed, embarrassed, or unsupported in managing their menstrual health.

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2.3 Hormonal Diseases

Polycystic ovarian syndrome (PCOS) is a hormone disorder that affects one in ten women between the ages of 15 and 44. It's the most common cause of female infertility and is linked to an imbalance of reproductive hormones is a hormonal disorder triggered by faulty nutrition and lifestyle that can cause irregular periods, prolonged menstrual cycles, or even the absence of periods with acne, weight gain, and excess hair growth. Several of these issues can become serious if left untreated or uncontrolled as menstrual irregularities due to PCOS can lead to long-term complications such as infertility, diabetes, and heart disease and is also a risk factor for endometrial,breast and ovarian cancer if not managed properly.Studies shows that women with PCOS are three times as likely to develop endometrial cancer when compared to women who do not have PCOS. The studies show that PCOS itself doesn't directly cause ovarian cancer, but it may contribute to an increased risk due to hormonal imbalances and other underlying factors like insulin resistance,chronic inflammation and lifestyle factors. In India, studies show the prevalence of Polycystic Ovary Syndrome (PCOS) among teenagers ranges from approximately 9% to 23%, though different studies show variations based on region, lifestyle factors, and the diagnostic criteria used. Diagnosis is often challenging in adolescents because many symptoms, such as irregular periods, overlap with normal pubertal development. For instance, pilot study in Tamil Nadu showed a higher proportion of PCOS in urban adolescents compared to rural participants. This difference was potentially linked to dissimilar dietary practices and levels of physical activity. Staying informed and working with healthcare providers allows women with PCOS to monitor their health and address potential risks proactively.

Treating hormonal imbalances and maintaining a healthy lifestyle are crucial in managing PCOS effectively. Several studies have emphasized the importance of a balanced diet rich in essential nutrients such as iron, calcium, vitamins, and omega-3 fatty acids to support overall health and positively influence menstrual health by regulating hormone levels and alleviating symptoms of menstrual disorders. It emphasized the importance of adopting healthy eating patterns early on to reduce the risk of developing menstrual disorders and reproductive health issues later in life. There are recommendations for cruciferous vegetables for their compounds that support estrogenic metabolism, potentially reducing symptoms of hormonal imbalances. Girls are encouraged to include berries,citrus fruits, whole grains ,lean proteins, green & cruciferous vegetables, probiotics rich food,ginger,turmeric,healthy fats in nuts,seeds in their diet for their antioxidant and anti-inflammatory properties, which may help reduce menstrual pain and to support hormone production [13,14,15].

2.4 Linkage between Menstrual Health and Overall Health

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Many studies have suggested it is essential to have awareness among adolescent girls to have normal regular menstrual cycle as long and irregular cycles are associated with insulin resistance, hyperandrogenism [16], and chronic inflammation [17], which are in turn risk factors for cancers [18,19], particularly for obesity-related cancers [20,21], like ovarian and uterine cancers. .

The finding of higher total cancer risk with increasing menstrual cycle irregularity and length of agreement in several studies with association of PCOS with cancer risk [22]. Given the high prevalence of overweight/obesity in the young population, reporting long/irregular cycles in this study population is important .

A study by the Department of Obstetrics and Gynecology, Omega Hospital in Nagpur, India on awareness of PCOS amongst adolescent and young girls, showed that 28% of adolescent and young girls were unaware of PCOS [23].. Since many women with PCOS experience chronic anovulation, meaning they do not release eggs regularly, this prolonged exposure to unopposed estrogen can heighten cancer risks. A monthly menstrual period isn't just a monthly inconvenience; it's a health report card. Changes in flow, frequency, or symptoms could mean something more than just hormonal fluctuations. Understanding these changes is key because your menstrual health can offer important clues about your overall well-being, including potential risks for certain cancers and timely treatment of menstrual irregularities may decrease the risk of developing and dying from female cancer later in life. This shows that more than just acne and unpredictable periods PCOS can trigger hormonal conditions that increase the risk of endometrial cancer

The connection between early menarche (onset of period) and breast cancer is well documented. If a girl gets her first period before she hits 12yrs longer exposure to estrogen over a lifetime can fuel the development of certain cancers like breast cancer. A comprehensive analysis by the Collaborative Group on Hormonal Factors in Breast Cancer, which pooled data from 117 epidemiological studies involving 118,964 women with invasive breast cancer and 306,091 controls, found that each year younger at menarche was associated with a 5% increase in relative breast cancer risk [24]. Similarly, another research indicates that women who begin their periods before age 11 have about a 15% to 20% higher risk of breast cancer compared to those who start at age 15 or older[25]. These findings underscore the importance of regular breast examinations and mammograms , especially for women who experienced early menarche.

In the 1990s, the research group pioneered studies on menstrual cycle length, menstrual regularity, and the number of menstrual cycles as risk factors for breast cancer [26,27]. Women who developed breast cancer were more likely to have short, regular cycles, and had more cycles before the first full-term pregnancy than healthy women and those with benign breast disease. Cell division is generally considered a prerequisite for carcinogenesis and women with short and

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numerous cycles may therefore have a higher risk of developing cancer as a result of increased cell proliferation and exposure to higher progesterone levels. Although progesterone protects against endometrial cancer, it appears to have a different effect in increasing breast cancer risk [28, 29, 31, 32, 33].

Studies conducted in Global South also reveal similar patterns, indicating the lack of awareness regarding menstrual health. A cross sectional study from National Family Health Survey on Menstrual and reproductive factors associated with risk of breast cancer among Indian women also documented that breast cancer is the most common cancer and the leading cause of death for women worldwide [34,43]. India has one of the highest rates of the most aggressive subtype of BC referred to as Triple Negative Breast Cancer (TNBC). In India, the incidence rate has significantly increased, almost by 50%, between 1965 and 1985 [36]. The estimated number of incident cases in India in 2016 was 118,000 [37] and will rise up to 200,000 per year by 2030 [38]. Hence, in India, on an average, for every two women newly diagnosed with breast cancer, one is dying from this disease. The screening coverage in the country is lower than the other countries [39,40]. The existing study mentioned that less than 10% of Indian women, which ranges from 25.3 to 48.4%, ever undergo breast examination or participate in screening activities. While, screening average in other Asian countries, like China and Thailand was 57.6–82.3%, and i 55.8–63.6% respectively. The lack of awareness, social stigma, familial negligence, financial constraints , and lack of specialized health infrastructure are main contributing factors to low coverage of screening rate, late detection and high mortality due to cancer [41]. Breast cancer screening was minimal in Andhra Pradesh, Meghalaya, Chennai, Bhopal, and Delhi where the incidence of breast cancer reported was very high. The record from the National Family Health Survey − 4 in the year 2015-16 that only one in ten women aged between 15 and 49 years had undergone screening for breast cancer [42]. The survival rate of breast cancer is poor in India as compared to Western countries due to earlier age at onset, late stage of disease at presentation, delayed initiation of definitive management and inadequate/fragmented treatment [43, 44, 45, 46].

Most of the studies cover socio-economic and intersectional regional variations of women' evidence of menstruation status and reproductive factors on women's breast cancer is rare in the country. Early-onset of menarche was related to early and greater cumulative exposure to estrogen, in which the presence of progesterone can increase the risk of breast cancer, particularly in the luminal A subtype in which estrogen exposure is most relevant" The number of pregnancy play a potential effect on breast cancer such as reducing the estrogen and progesterone hormones and increasing the sex hormone-binding globulin, which is reduced the risk of breast cancer screening[47,48]. Another study indicates that in the pre-menopausal period, each full-term pregnancy leads to a 3% reduction in breast cancer and it reaches 12% in

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post-menopausal women. Furthermore, those women who had given birth at the exact age of 30 years had significantly lower participation for breast screening as compared to those who are given first birth after the age of 35 years. The longer duration of breastfeeding practices (> 24 months) has a protective effect on breast screening. Age at starting oral contraceptive use might be determinant in increasing breast screening. A higher level of an increased body fat mass has been associated with early puberty and menarche **[48]**. A study has suggested that increasing the BMI level increases the testosterone which is the influence of elevated androgens with polycystic ovary syndrome, (49) and those women who are overweight have higher levels of these hormones even in the absence of polycystic ovary syndrome [49,50,51,52,53,54,55,56,57].

The menstrual cycle is often under-appreciated in breast cancer research. However, recent research suggests that menstrual cycling affects predictive biomarker expression and treatment outcomes in cancer [56, 57, 58]. So there is a pressing need to record information about the menstrual cycle of adolescent girls. Many doctors have urged and motivated the HPV vaccine asvaccinating girls aged nine to 14 years against the Human Papillomavirus (HPV) is crucial for prevention of cervical cancers and a few other cancers [58]. But equally important is vaccinating boys against HPV.The Indian medical fraternity should promote the HPV vaccine by conducting awareness sessions in educational institutes and community centres to eliminate cervical cancer in the country and counter vaccine disinformation [58]. A recent systematic review summarized the evidence that educational interventions increase HPV vaccination acceptance[57] Hence, there is an urgent need to create awareness about cervical cancer and the HPV vaccine. In a study about half of the students (52.4%) had little knowledge and awareness on HPV infection or HPV vaccine but expressed willingness to know more. In another study, 98 (42.4%) participants were aware that HPV is transmitted through sexual contact [57] .This knowledge is very important from the point of view of prevention as having multiple sexual partners increases the risk of infection with HPV. In the study, only 15.3% of the students were aware that the cervical cancer vaccine was available in India. The role of healthcare providers, (doctors, nurses, Anganwadi workers, medical social workers etc.) school counsellors, and teachers in creating awareness about cervical cancer and HPV vaccination to adolescents cannot be over-emphasized. Using social media, education videos, or even posters will help make health education interesting and impactful. We need to have timely discussions about the risk factors and preventive measures of cervical cancer with adolescents to catch them young [54,57].

2.5 Relevance of Early start to bridge the gap

Adolescence is considered a critical period during which lifelong behaviours, specifically health and hygiene patterns are established among adolescents. It is no surprise that this group, especially girls, represent an important target group not just for cervical cancer awareness but for breast cancer education and awareness. A study on adolescent girls on Breast Cancer Awareness

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(14-18 yrs.) demonstrated that adolescent girls have insufficient knowledge about breast cancer [61].Another study revealed that 65% of adolescent girls were not aware of breast self-examination breast cancer symptoms[62]. Consistent with these results, several studies indicate that adolescents possess limited knowledge about breast cancer risk factors and symptoms and educational intervention significantly increased adolescent knowledge about breast cancer risk factors and symptoms, aligning with the results of studies on effect of breast cancer awareness education in adolescent girls conducted in other countries. Another study found that the educational program increased adolescents' knowledge about breast cancer risk factors and symptoms [61]. In a study conducted in two high schools, the knowledge level of adolescents about breast cancer risk factors increased from 33% to 55%, and the knowledge level regarding these risk factors rose from 55.0% to 79.0% [62]. While some risk factors for breast cancer are related to genetics, others are associated with an individual's lifestyle. The modifiable risk factors for breast cancer often relate to lifestyle habits, such as exercise, diet, alcohol consumption, and tobacco use. Increasing awareness levels among young individuals about lifestyle habits can lead to modifications in such behaviours. Breast cancer awareness involves enhancing health behaviours through education on early diagnosis, risk factors, symptoms, self-breast examination and healthy lifestyle . Early detection of breast cancer can increase the likelihood of positive outcomes, leading to improved survival rates and quality of life for women. Moreover, research indicates that women's awareness of the disease can substantially contribute to their health behaviours. Various educational models and tools have been employed to increase awareness in studies conducted on this topic. In one study, they evaluated the effectiveness of an educational program developed based on the Health Belief Model (HBM). This model, frequently utilized in breast cancer education, has had its effectiveness validated. It encompasses dimensions such as perceived susceptibility, severity, benefits, barriers, and cues to action. The incidence in the age group between 15–24 is 3.1 per million of population in the UK. In the United States, the probability of developing breast cancer remains at 0.5% for women aged less than 39 years and 3.8% for women aged 40–59 years [63]. Though breast cancer is rare in younger age groups, it is generally more aggressive in this category, with lower survival rates. An international survey showed poor awareness of risk factors for breast cancer among university students from 23 countries, compared to older women. This emphasizes the importance of promoting breast cancer awareness among young women especially adolescent high school girls [71].

The coverage of reproductive health and its link with female cancers in school textbooks is very limited. And varies significantly across different regions and educational systems [64]. Reproductive health textbooks typically cover basic anatomy and physiology of the male and female reproductive systems, including puberty and the menstrual cycles, sexually transmitted infections (STIs) and contraception. Some textbooks and educational programs address topics

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like maternal care, post-natal care, and the importance of breastfeeding [65] However the health literacy with regard to reproductive health Link with female cancers is poor and Limited as the direct link between reproductive health and female cancers like breast , cervical cancer and ovarian might not be extensively covered in all curricula.Some aspects of reproductive health education, like awareness of risk factors for STIs (including HPV which is a major cause of cervical cancer), may indirectly contribute to awareness about female cancers.The depth and breadth of reproductive health education vary depending on the specific curriculum and age group, according to BMC Women's Health and the National Journal of Community Medicine [65].

Cultural and religious sensitivities can influence the extent to which certain topics, like sexuality and contraception, are discussed in school. Teachers may lack adequate training and resources to effectively deliver reproductive health education.Inadequate information and focus on specific cancers: Studies have revealed limited awareness among students regarding specific female cancers like breast cancer and its prevention and screening methods [66,67,68,69]

In a study, about knowledge of and attitude toward breast cancer and its screening methods, more than one third (35%) of the participating students thought that only women could suffer from BC. Overall, 41% of students were unaware of its symptoms, and 36.7% of students thought that painful lumps were a sign of BC. More than half of the students thought they would be at risk for the disease if they had a positive family history or were over 40 years old. More than 70% of them had no information (i.e., time and procedure) about BSE, nor had they received any education on the subject. Only 23% of students had been educated on BSE, and these had received information given mostly by midwives and gynecologists (10.3%). Most students were also unaware of other screening methods such as clinical examination and mammography.Their results revealed that more than 87% of students were unaware or had incorrect information regarding breast cancer screening. The link between the type of breast cancer information sources and students' general knowledge was significant. Most students were aware of the risk of breast cancer, but they were uninformed of its symptoms, risk factors, and prevention strategies, and students with a family history of breast cancer had a higher score in terms of mammography knowledge than students with no family history of breast cancer,the awareness regarding breast cancer and screening methods is not acceptable [70].

3. Research Objectives:

Therefore, based on the literature reviewed, this study seeks to examine the following:

1. To what extent are adolescent girls in Gurgaon aware of the relation between poor nutritional health and irregular menstruation?

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2. Are adolescent girls in Gurgaon aware of the long-term health risks, such as PCOS and ovarian cancer, associated with menstrual irregularities and duration of symptoms?

4. Research Questions:

Based on the above mentioned research objectives, the research questions for this study are:

1. What is the level of awareness among adolescent girls regarding the link between nutrition, menstrual irregularities, and long-term health risks?

2. How long have they been experiencing these symptoms, and how have they responded to them?

3. What cultural, educational, familial, or psychological factors prevent adolescent girls from visiting a gynaecologist?

4. What are some of the persistent myths and misconceptions and informational gaps about menstrual and reproductive health exist among adolescent girls in Gurgaon?

5. Research Method

Methodology

A cross sectional sampling study was undertaken to assess the awareness levels among adolescent girls in gurugram on menstrual ,hormonal and reproductive health and female cancers. Expert guidance, review and suggestions were taken from the City Medical Officer and gynaecologist for survey design and credibility. High school girl students from local government & private schools were provided with surveys after their consent & permissions to participate in the same. Target sample size was 100 girls aged 12–17 in Gurgaon schools. A sample size of 100 is the minimum needed for meaningful results and should represent 10% of the target population. Gurugram was chosen because of Urban-rural divide and health infra structure.Gurugram includes elite private schools, government schools, and semi-urban villages (like Badshahpur, Wazirabad),and proximity to multi-specialty hospitals (Medanta, Artemis) and public CHCs (Community Health Centres) making it ideal for comparing awareness and nutritional differences.

An anonymous research survey was conducted by a student researcher studying adolescent girls' awareness by development of anonymized questionnaire forms (online) with the parameters it sought to investigate. The survey collected quantitative data responses by the adolescent girls on the questionnaire on demographics, nutrition habits, menstrual history & irregularities, awareness of PCOS, gynaecological risks, barriers to consulting gynecologists and gaps in

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school curriculum. Ethical considerations, anonymity, confidentiality and informed consent were ensured and complied with. Research findings were summarized in tables & pie diagrams and the data analysis was done.

6. Research Findings & Data Analysis:

Responses were received from 99 adolescent girls between 14-18 years of age. Table 1 below shows a brief overview of their nutritional levels:

Table 1: Demographic and Nutritional Overview of Respondents

Category	Subcategory	Sample %
Age	14 years	5.1
	15 years	10.2
	16 years	30.6
	17 years	35.7
	18 years	18.4
Type of School	Private	96.9
	Government	3.1
Dietary Preference	Non-Vegetarian	53.6
	Vegetarian	29.9
	Eggetarian	16.5
School Meals	Home tiffin	60.8

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	School canteen	25.8
	No food intake during school hours	13.4
Fruit Consumption	Often/Daily	48.0
	Sometimes	41.8
	Rarely	10.2
Green Leafy Vegetables Intake	Often/Daily	22.4
	Sometimes	48.0
	Rarely	28.6
Curd & Milk Intake	Often/Daily	59.2
	Sometimes	22.4
	Rarely	15.3
	Never	3.1
Junk Food	Often/Daily	24.5
	Sometimes	55.1
	Rarely	20.4

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Iron-Rich Items	Often/Daily	19.6
	Sometimes	46.4
	Rarely	34.0
Supplements	Regularly	24.5
	Sometimes	38.8
	Never	33.7
	Others	3.0
Deficiency	Iron Deficiency Anemia (IDA)	43.9
	Vitamin D/Calcium Deficiency	27.6
	None	28.6
Source of Health Information	Parents	51.0
	Doctors	23.5
	Friends	14.3
	School lessons	10.0
	No information	2.3

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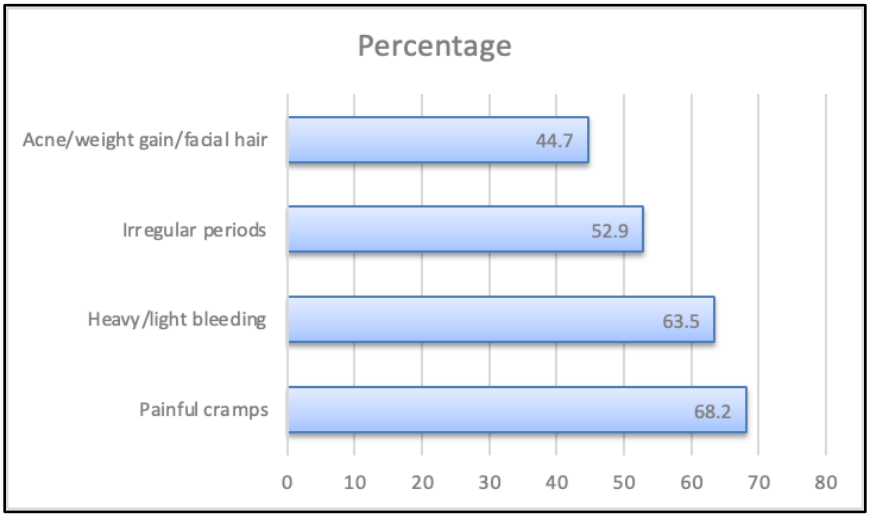
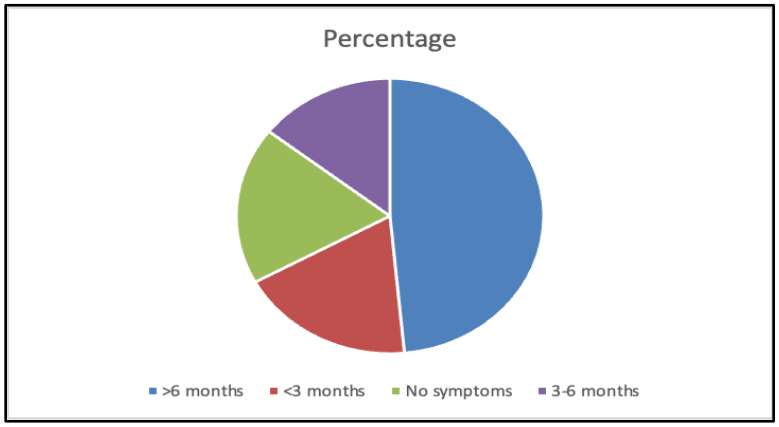
Graph 1: Menstrual Health Symptoms



Respondents were asked about the most common symptoms experienced. Painful menstrual cramps was one of the most commonly reported symptom with 68.2% respondents reporting painful menstrual cramps throughout their menstrual cycle, heavy or light bleeding was reported as the second most prominent symptom (63.5%), followed by 52.9% respondents reporting experiencing irregular period, while 44.7% reported experiencing acne, weight grain, or abnormal growth of facial hair, a symptom closely associated with hormonal disorders like PCOS.

Graph 2: Duration of Menstrual Symptoms



While experiencing such symptoms, it is also important to map the duration of experiencing such symptoms. As indicated in Graph 2, an overwhelming 48.5% adolescents reported experiencing such symptoms for over 6 months at the time of conducting the survey, while 14.5% reported

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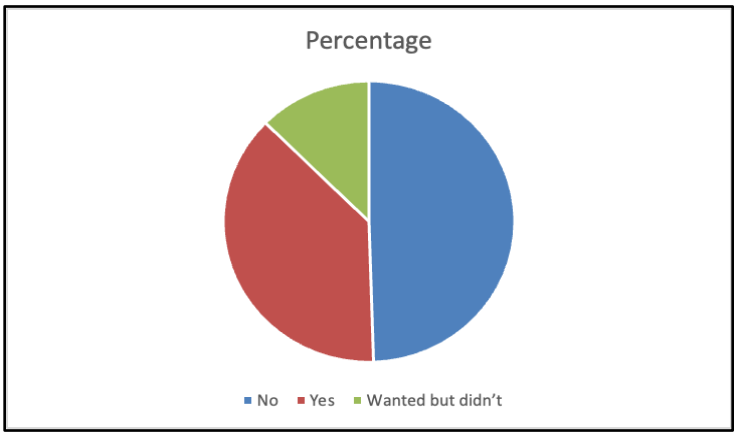
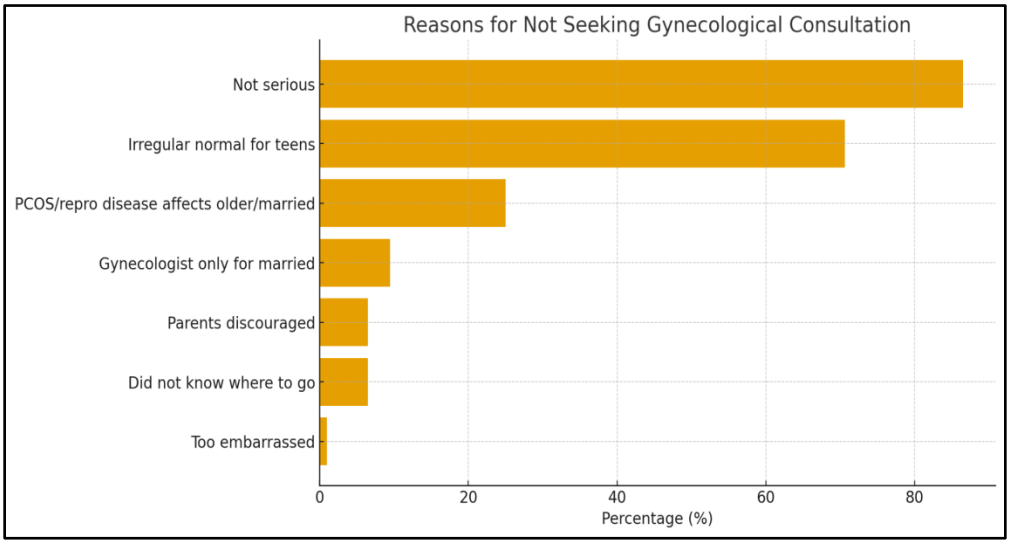
experiencing for last 3-6 months, 18.5% reported experiencing the symptoms for less than 3 months and only 18.5% reported experiencing none of the symptoms mentioned above.

Graph 3: Propensity to Seek Medical Consultation



Among those experiencing symptoms, 49.5% reported never having consulted with a medical specialist like a gynecologist or any other doctor; only 37.9% reported having sought medical advice, while 12.6% reported that they wanted to but did not in practice. This shows that while respondents experience multiple alarming symptoms, in very few cases do they or their families (since adolescents are dependent on parental advice) take the initiative to seek expert advice; this also shows the cultural tendency of dismissing such symptoms as mundane, thereby increasing susceptibility to long-term health risks.

Graph 4: Reasons for Not Seeking Medical Consultation



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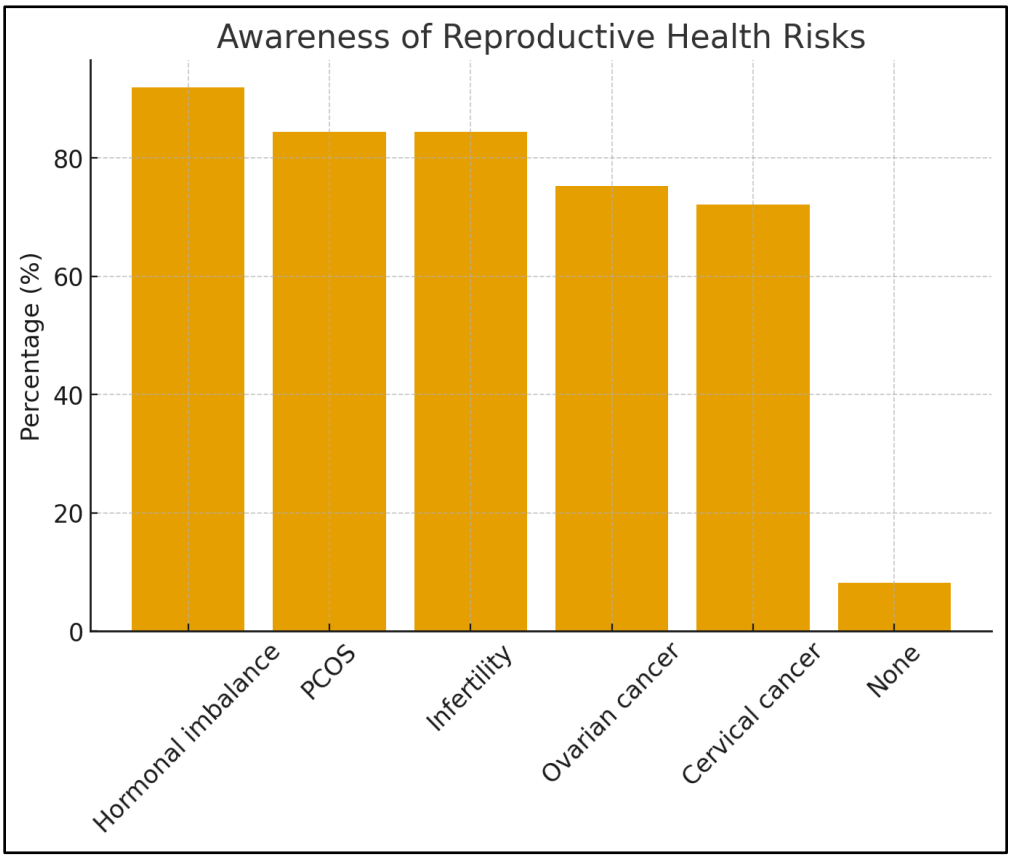
This attitude is clearly reflected in Graph 4, where 86.5% respondents reported that they felt that the symptoms were not serious and did not require medical consultation. Approximately 6.5% respondents reported that they lacked knowledge about where to go (6.5%), experienced parental discouragement (5%), and avoided visiting a doctor due to embarrassment (1%). These responses underline the socio-cultural and informational barriers limiting adolescent girls' healthcare access.

Graph 5: Awareness of Reproductive Health Risks



Despite such socio-cultural barriers and lack of knowledge, 92% of girls were aware of reproductive health risks like hormonal imbalance, and PCOS (84.5%), followed closely by infertility (84.5%), ovarian cancer (75.3%), and cervical cancer (72.2%). However, 8.2% reported no awareness of any risks. While awareness appears high, it is largely superficial and does not necessarily translate into understanding of underlying causes, prevention, or treatment pathways. Only a small proportion of respondents were aware of the HPV vaccine; 35.2% had never heard of it, and 20.9% had only heard the term without further knowledge**.** This points to the gap between basic recognition of health terms and practical reproductive health literacy.

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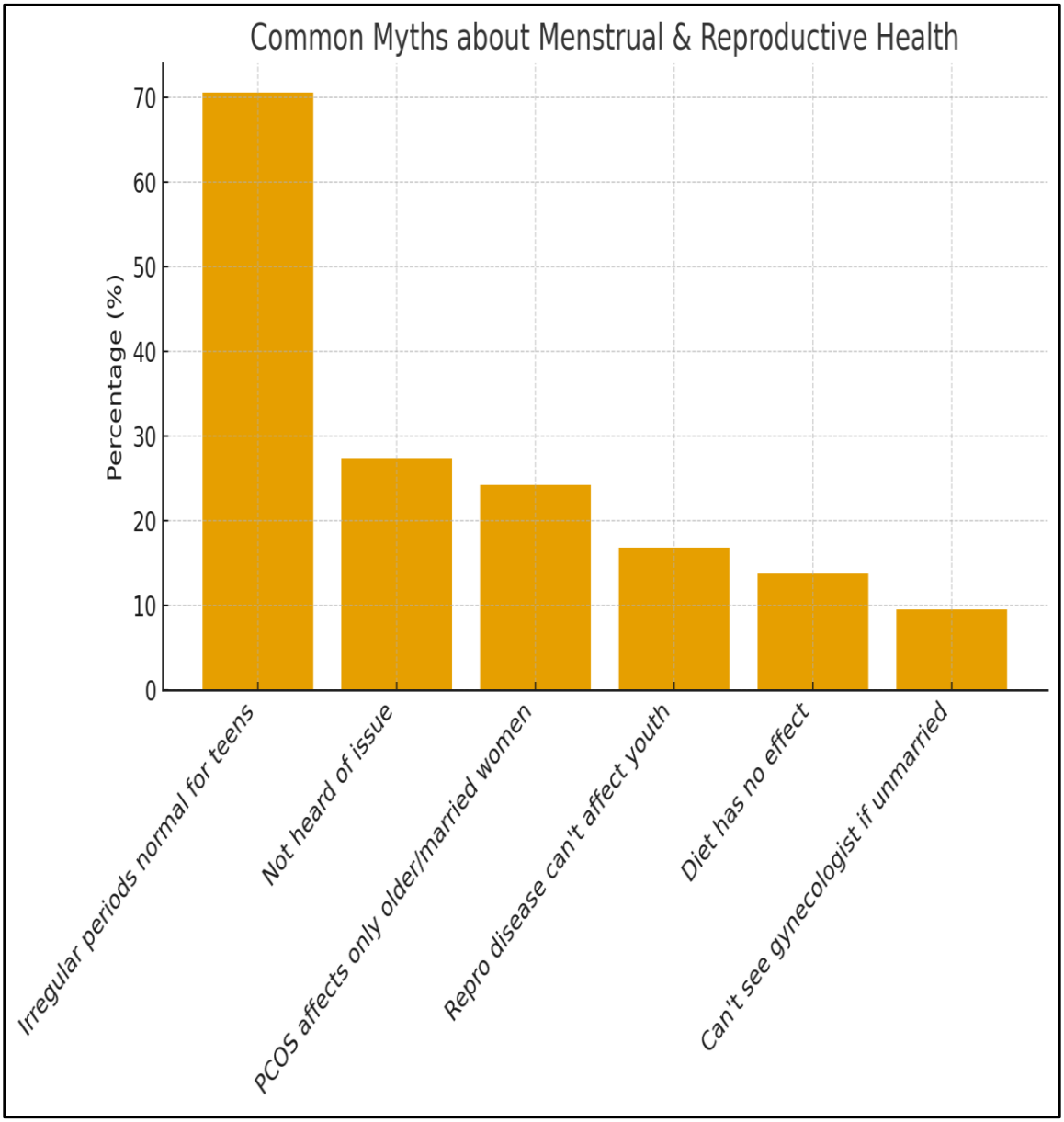
Graph 6: Myths and Misconceptions



This is further reflected in the response to common myths and misconceptions surrounding menstrual and reproductive health. Approximately 70.5% considered irregular periods normal for teenagers, while 24.2% believed PCOS affects only older/married women, and 16.8% thought reproductive diseases cannot occur in youth. Smaller proportions dismissed diet's role (13.7%) or considered gynaecologist visits restricted to married women (9.5%). These misconceptions highlight urgent educational needs.

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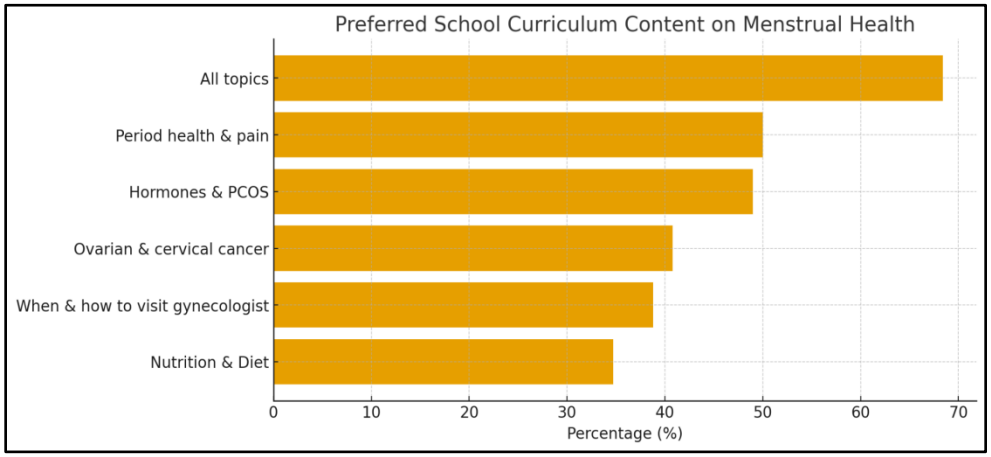
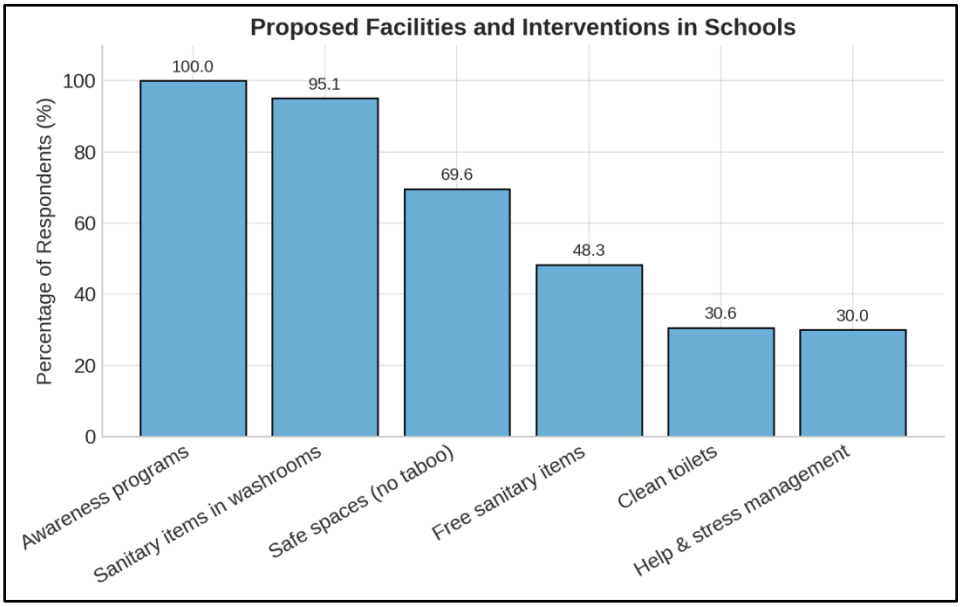
Graph 7: Preference for Curriculum on Menstrual Health



It was encouraging to note that majority (68.4%) respondents were willing to study all relevant topics if included in their curriculum. Among the specific topics preferred, period health and pain management was supported by 50% respondents, while 49% desired to know more about hormones and PCOS; 40.8% were interested in ovarian and cervical cancer, and interesting 38.8% desired guidance on how and when to visit a gynaecologist (38.8%), and the nutritional and dietary requirements (34.7%). This indicates strong demand for holistic reproductive health education.

Graph 8: Desired Interventions in Schools



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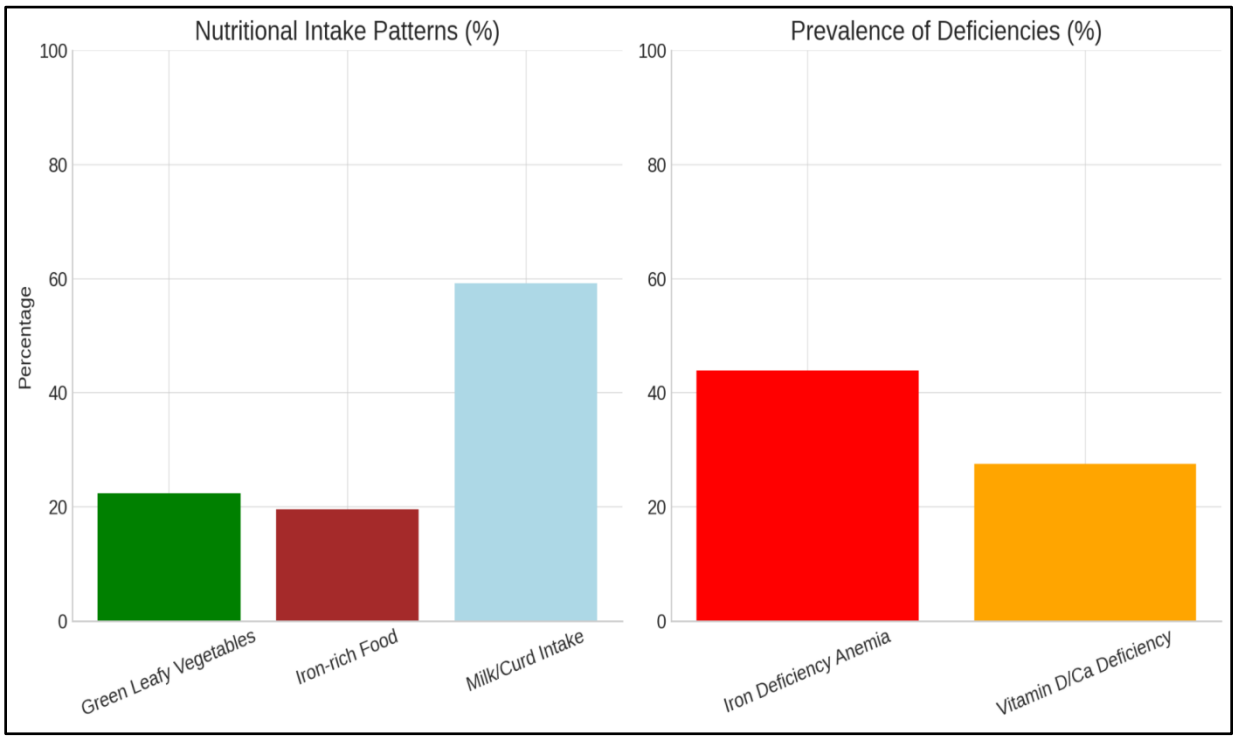
As school students, respondents were asked about the nature of interventions they would like to see in schools. Awareness programs on menstrual health, hygiene and associated health risks were unanimously supported by all respondents. Further 95.1% respondents desired availability of sanitary items like pads in school washrooms, and 48.3% respondents desired that such items be available to students for free. Approximately 69.6% girls desired safe spaces for them to change clothes or sanitary items without being subject to any judgement or taboos, and approximately 30% respondents desired cleaner toilets and help in managing associated stress.

Graph 9: Nutritional Intake and Deficiencies Among Respondents



A critical part of effective menstrual health management is dependent on adequate nutritional intake. Only 22.4% of girls consumed green leafy vegetables and 19.6% consumed iron-rich foods regularly, while 59.2% reported daily milk/curd intake. These dietary gaps directly reflect deficiencies, with 43.9% reporting iron deficiency anemia and 27.6% vitamin D/calcium deficiency. The findings highlight the urgent need for school-based nutrition programs alongside menstrual health education.

Often answering a survey questionnaire allows respondents to reflect upon their existing and desired reality. Keeping this in mind, students were asked to freely suggest what schools and the government should do to ensure good health among girls.

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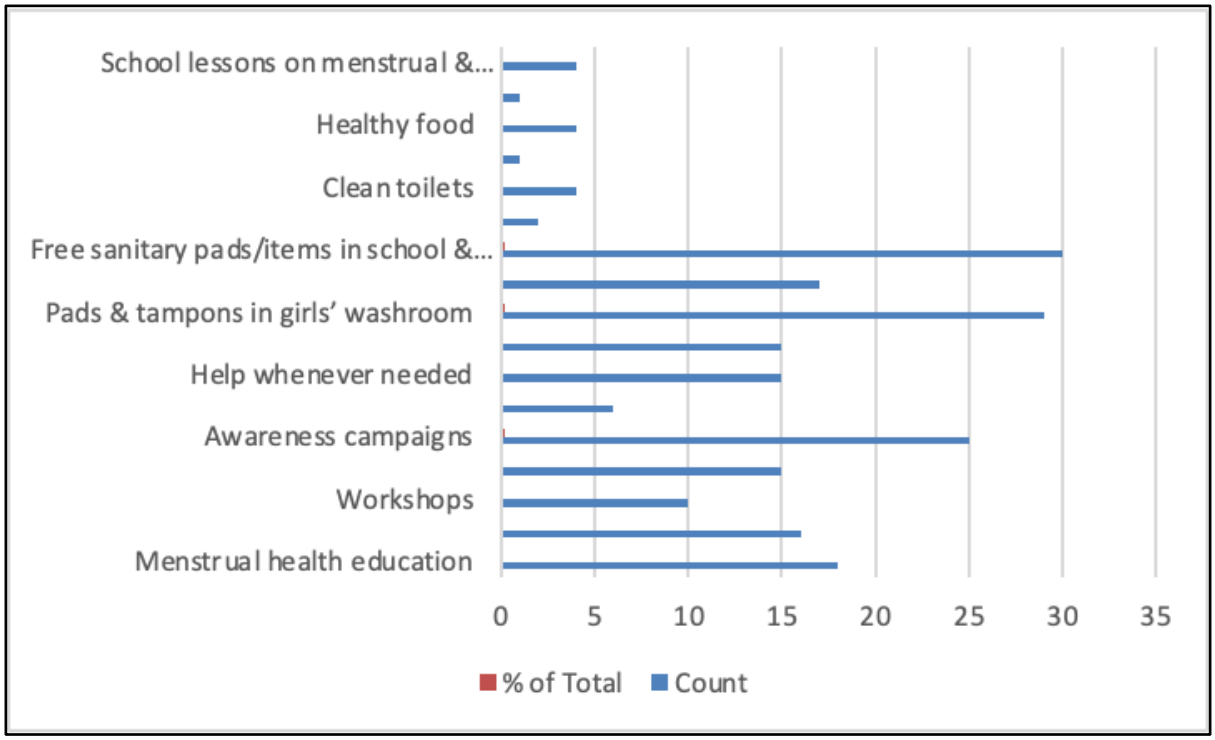
Graph 10: Suggestions for Change



As illustrated in the figure above, respondents' own suggestions reveal a strong demand for infrastructural support, awareness and education. Approximately, one-third of respondents desired provision of sanitary items in schools and communities, including free distribution and washroom access. Awareness and education-related initiatives, including menstrual health education (10%), hormonal health education (8.9%), and broader awareness campaigns (13.9%), together accounted for more than one-third of all suggestions. Only a small percentage suggested medical facilities like free consultations (1.1%) or vaccination camps (0.6%), reflecting both limited awareness and low prioritization of preventive healthcare among adolescents. In summary, the findings point towards the urgent need for integrating awareness, stigma reduction, and infrastructural provisions in school-based intervention.

7. Discussion:

The above findings illustrate that 43.9 % girls had IDA (iron deficiency anemia), while 27.6% respondents reported experiencing Vitamin D and calcium deficiencies. Several studies have emphasized the importance of taking a balanced diet, rich in essential nutrients such as iron, calcium, vitamins, and omega-3 fatty acids, to support overall health and positively influence menstrual health; this has also been proven to regulate hormone levels and alleviate symptoms of

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menstrual disorders [13-15]. The results of this study showed that approximately 85.8% adolescent girls had experienced menstrual irregularities, yet at the same time, approximately 86.5% girls did not consider it to be a serious health risk, while 70.6 % had a misconception that it is normal for teens to have menstrual irregularities. Similarly, 27% of respondents were of the opinion that PCOS and reproductive diseases affect older or married women. The health information about menstrual, hormonal and reproductive health in school curriculum was 10%, while 66% had not been a part of any school lessons on PCOS or hormonal health and female cancers. Only 20.9% of adolescent girls had heard about the HPV vaccine. The findings of this study resonate with previous studies [54, 60, 61-70] which have also documented poor awareness and knowledge about the same in adolescent girls, and the need for increased knowledge for the same among adolescent girls with regards to symptoms and screening [61,62].

The findings of this study illustrate the critical relation between menstrual health awareness, cultural attitudes, and infrastructural needs among adolescent girls. In addition to highlighting the gaps, an important finding of this study is the dual emphasis placed by respondents on both material support, such as the provisioning of free sanitary items and clean washrooms, and knowledge-based interventions, in the form of formal menstrual health education in schools and community, awareness campaigns, and cultural changes to remove taboos on menstrual health. This is consistent with evidence that poor knowledge of reproductive health contributes not only to late diagnosis of conditions such as PCOS or anemia but also to the reinforcement of myths and stigma. The findings clearly point to the lived reality of young girls, where lack of adequate facilities often coexists with gaps in knowledge and persistent myths surrounding menstrual and reproductive health. The fact that “removing taboo” and creating a “safe environment to talk” emerged as notable categories suggests that adolescents perceive menstrual health as a deeply social and cultural issue, where silence and stigma often lead to physical symptoms in future. The findings also point towards insufficient access to basic menstrual hygiene products, which remain a critical challenge, even among the largely urban sample group.

Several studies have demonstrated infrastructural constraints, particularly lack of clean toilets and availability of sanitary products, contribute significantly to absenteeism and disengagement among adolescent girls [Sommer et al., 2016; van Eijk et al., 2019], the findings of this study also hint at the same problem, although absenteeism was not explicitly recorded. Interestingly, relatively fewer suggestions focused on medical consultation and preventive health, such as free gynecological check-ups (1.1%) or vaccination camps (0.6%). This could reflect limited awareness about preventive healthcare and the tendency to normalize menstrual irregularities as non-serious. Such findings highlight a significant gap in the health-seeking behavior of adolescents, pointing to the need for school-based programs that not only disseminate

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information but also encourage active utilization of healthcare services especially among parents of young girls who as guardians are primarily responsible for all health and medical decision recommendations.

Additionally, a qualitative survey of NCERT Biology textbooks revealed that the curriculum only focused on core biological concepts and theoretical knowledge, rather than focusing on health literacy. Therefore, this lack of awareness training could be addressed through additional sessions or changed curriculum.

Taken together, these findings call for a multi-level approach that integrates infrastructural provisions with comprehensive health education. Schools can play a transformative role by ensuring access to sanitary facilities, embedding menstrual and reproductive health within the formal curriculum, and creating safe, stigma-free spaces for dialogue. However, for such interventions to be sustainable, they must be situated within a broader ecosystem that involves parents, healthcare providers, and community actors.

8. Conclusion:

This study revealed significant gaps in awareness, consultation practices, and school-based education on menstrual and reproductive health among adolescent girls. While symptoms such as painful cramps, irregular periods, acne, etc. were reported, awareness regarding medical consultations remained largely limited due to myths and misconceptions, stigma, lack of awareness among adolescent girls and their parents, and socio-cultural factors. The findings emphasise the importance of integrating menstrual health and its associated risks into school curricula and community knowledge, ensuring better access to sanitary products and creating safe, stigma-free environments. This study is limited by its reliance on self-reported data and its focus on a single location which may restrict broader generalisation. Also, the study could have benefitted from a wider socioeconomic profile of respondents. Nevertheless, this study provides valuable insights into adolescent girls' menstrual health in India, and underscores the need for structured school-based interventions and healthcare access that can foster long-term improvements in awareness, well-being, and disease prevention. More importantly, since this study was conducted among respondents belonging to a largely urban and cosmopolitan location, the presence of such gaps point towards the severity of conditions in semi-urban or rural areas and the urgency for extending similar interventions beyond metropolitan regions. Encouraging timely access to gynecological healthcare services, would ultimately enhance reproductive health outcomes and facilitate the prevention of cancer among females. Actively involving parents, communities, and health professionals in designing and implementing reproductive health education can help overcome barriers and gather sound support.

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This study intends to highlight that female cancer awareness programs have not primarily targeted school students. It is a call of time to evaluate the knowledge about breast self-examination (BSE), ovarian and cervical cancers among adolescent schoolgirls to incorporate awareness programs aimed specifically at this important target group. Lack of accurate information, absence of proper guidance, parent's ignorance, lack of skills and insufficient services from the health care delivery system are the major barriers. This study suggests that interventions should focus on providing gynecologist's consultations merged in routine high school health programmes and encourage and guide behavioural change towards leading a healthy lifestyle with good nutrition. It is important to begin creating awareness about the links between menstrual, hormonal, reproductive and sexual health, nutrition, lifestyle choices and female cancers in high school adolescent girls. Though some aspects of menstrual irregularities and reproductive health are covered in school textbooks, the extent and depth of coverage, particularly regarding the link with female cancers, can be improved. It is recommended that educational programs be implemented to increase the awareness of students in schools, so that the number of health check-ups and preventing screenings increases with the institutionalization of this information. Likewise, by transferring information through students to their families, the level of awareness in the whole society can be enhanced.Ultimately, a more holistic approach, taking into account religious and cultural sensitivities, along with adequate training for educators is required to empower adolescent girls with the knowledge and understanding to make informed decisions about their health and well-being.

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