# EFFECTIVENESS AND SIDE EFFECTS OF SYANAPRESS (SUBCUTANEOUS DEPOT MEDROXYPROGESTERONE) IN FEMALES OF REPRODUCTIVE AGE GROUPS

Arooj Fatima[1], Mehwish Ayyaz[2] and Aun Khan[3]

1. Women Medical Officer: Lady Aitchison Hospital Lahore / KEMU
2. Senior Registrar Lady Aitchison Hospital Lahore/KEMU
3. Aun Khan: Medical officer, Mayo Hospital Lahore/ KEMU

**ARTICLE INFO**

**Corresponding author:**
Dr. Mehwish Ayyaz, Women medical officer: Lady Aitchison hospital Lahore / KEMU
**Email:**
dr.mehwishayyaz@gmail.com

**Vol: 3 | Issue: 2**
ISSN Print: 2960-2580
ISSN Online: 2960-2599



**Publisher:**
Medical Research and Statistical Consultancy Training Centre (SMC-PRIVATE) Limited

**Author's contributions**
**Arooj Fatima:** Conceptualization, data collection, analysis and Literature search
**Mehwish Ayyaz:** Conceptualization, data collection, analysis, literature search, drafting
**Aun khan:** Conceptualization, data collection, analysis, results
**Keywords:**
Contraception, Sayana Press, Injectable Contraceptives, Efficacy, Side Effects.

**ORIGINAL ARTICLE**

## ABSTRACT

**Background:** Sayana Press® (injectable contraceptive) is associated with a high level of contraceptive efficacy. It is fascinating that effectiveness of Sayana press is sustained even if the time period of injection is prolonged from usual three to four months. **Objective:** To study the effectiveness and side effects of Sayana press in the females of reproductive age, in order to change existing contraceptive practice. **Methodology:** This descriptive case series was done in six-month duration (01-04-2023 to 30-09-2023) at department of obstetrics and gynecology Lady Aitchison hospital which enrolled 96 females after informed consent and followed up for study duration. Ethical approval and informed consent were taken before study conduction. SPSS-v26 was used for data analysis.

**Results:** Total 96 females of reproductive age group were selected for this study. Mean age of the patients was 31.95±5.06 year. Among 96 patients, 22(22.9%) were nulliparous, 35(36.5%) were primiparous and 39(40.6%) were multiparous. According to the efficacy of Sayana press, it was efficacious in 66(68.7%) patients and 30(31.3%) had side effects. **Conclusion:** The findings of the study revealed that Sayana Press, was deemed satisfactory by the women within our specific demographic. The information provided by this study is of importance as it not only provide significant perception to the government, but also serves as a pivotal milestone towards the potential implementation of Sayana Press.

## INTRODUCTION

Injectable contraceptives are efficient, safe and utilized all over the globe for pregnancy prevention and convenience. The regulatory agencies of about 40 international countries have approved Sayana Press® (depot medroxyprogesterone acetate subcutaneous injection (DMPA-SC), as a three-monthly contraceptive injection.[1] It is Uniject™ progestin-only, all-in-one injectable contraceptive, which contain both drug and needle within same device. The seamless application of Sayana Press due to its light weight, compact size and user-friendly design, necessitate minimal training for smooth use. [2]

In 2012, 57% of reproductive-age women expressed a desire to not have a child. But birth control was inaccessible to almost 222 million women; 97 million of them were in Asia and 53 million were in sub-Saharan Africa. For those areas which have access to education, training, and support, the use of, Sayana® Press is advocated by the World Health Organization (WHO). Sayana Press is studied by PATH, along with the help of the health ministries in Senegal and Uganda through 2017 for self-injection, so that they can find out how safely, efficiently and successfully they can help women in these countries to do it.[3-4]

For people at risk of hematoma because of bleeding disorders or anticoagulation, Sayana Press could be better than intramuscular DMPA. Headaches (8.9%), menorrhagia (7.1%), increased weight (6.9%), amenorrhoea (6.3%), and injection site responses (6.1%) were the most often reported adverse medication events (>5%).[5] The first-year failure rate of injectable progestin is 0.2% in ideal usage and 6% in common use. Estimates show that the use of contraceptives has reduced maternal mortality by 40% in poor nations and, if demand for birth control were to be fully addressed, could avert 70% of fatalities. Subcutaneous DMPA was well-tolerated and produced comparable results in terms of contraceptive efficacy and bone mineral density as DMPA-IM, according to a randomized, evaluator-blinded study that compared the two methods over two years with an optional third year involving 225 women from Brazil, Canada, and the US.[6-7] Sayana Press is a subcutaneous injectable contraceptive offering the advantages of ease of use, self-administration and long-acting efficacy. However, limited local data exist on its effectiveness and side effects profile among women of reproductive age. This study aims to evaluate the contraceptive efficacy and common adverse effects of Sayana Press to support informed contraceptive counseling and expand safe reproductive choices. [8-9]

## MATERIALS AND METHODS

**Study Design:** Descriptive case series study

**Study Setting:** Department of Obstetrics and Gynecology, Lady Atchison Hospital, Lahore.

**Duration of Study:** Six months 1-4-2023 to 30-9-2023

**Sample Size:** Total 96 patients were included in this study. Sample size of 96 patients was estimated by using 95% confidence level, 10% absolute precision with expected percentage of no side effects of Sayana Press in females of reproductive age group as 48.2%.[11] Using formula

$$n = \frac{Z^2 1\frac{\alpha}{2}.p(1-p)}{d^2}$$

$Z^2_{1-\alpha/2}$ = confidence interval = 1.96| p = prevalence = 48.2%| q = 1-p| d = absolute precision = 10%

**Sampling Technique:** Non-probability consecutive sampling

**SAMPLE SELECTION**

**Inclusion Criteria:**

- All females in reproductive age group presenting to the department of gynecology for family planning.
- Females having age 18-40 years.
- Females of reproductive age group of any parity.

**Exclusion Criteria:**

- Females with known or suspected pregnancy
- Female with undiagnosed vaginal bleeding
- Female with Severe liver dysfunction
- Female with Known hypersensitivity to MPA or any component of the drug
- Female using Additional Contraception(s) for Specific Use
- Female with Known or suspected malignancy of the breast
- Patients not willing to be included in the study

**DATA COLLECTION PROCEDURE**

A total of 96 females who fell into the reproductive age group were selected to participate in this study, all of whom sought family planning measures through the Department of Obstetrics and Gynecology. For comprehension, insight and voluntary participation, informed consent was taken from each patient prior to their inclusion in the study. Study was done after approval from hospital ethical committee (496/ RC/KEMU). Variables such as age and parity which are confined in baseline patient demographics were collected for thorough understanding of the participants.

Efficacy was defined when there were no side effects, and side effects were reported as given bellow. Self-reported discomfort in abdomen once per week and lasting for 30 minutes was considered as abdominal pain, nausea was considered when there was sensation of feeling the urge to vomit once per week and more than 30 minutes and forceful expulsion of stomach contents through mouth once in a week was defined as vomiting. Any episode of vaginal bleeding that requires changing a tampon more than 2 hours for 1 day per cycle was taken as heavy vaginal bleeding and self-reported pain in head twice a month and not attributed to neurological condition was defined as headache.

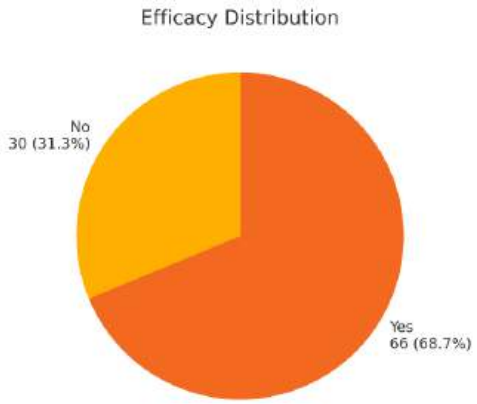
Pain at the site of Sayana Press injection was considered when they reported within 7 days of administration and lasted more than 24 hours is injection site pain. Amenorrhea was considered when there was absence of menstrual bleeding for 90 constructive days following the injection. Pain localized to lumbar region once a week interfering with daily activities was taken as backache.

Weight change was defined of there was a change of more than 2 kg in body weight from baseline over 3 months period. Decreased libido was defined as self-reported reduction in sexual desire for 4 weeks impacting quality of life. Other aches or pains are nonspecific body pains occurring at least twice per month. Effectiveness is absence of pregnancy in women using Sayanapress over six months period following the initial injection. Follow up of the patients who participated in study was vigorously done after their inclusion in the study, till the period they wanted to conceive again. The statistical software SPSS-v26 was used for data analysis. In order to effectively present the quantitative variable of age, the mean and standard deviation were utilized, enabling a more accurate depiction of the data. Conversely, qualitative variables such as parity and side effects were represented through frequency and percentages.

**RESULTS**

Total 96 females of reproductive age group were selected for this study. Mean age of the patients was 31.95±5.06 year. According to the efficacy of Sayana Press, it was efficacious in 66(68.7%) patients and 30(31.3%) had side effects **(Fig-1)**. According to the side effects distribution, 13(43.3%) had abdominal pain, nausea or vomiting, 11(36.7%) had irregular or heavy bleeding, 9(30.0%) had headaches, 7(23.3%) had injection-site pain or irritation, 7(23.3%) had amenorrhea, 6(20.0%) had backaches, 4(13.3%) had weight changes, 9(30.0%) had decreased

libido and 18(60.0%) had other aches or pain. **Fig-2.** Stratification of side effect with respect to age and parity has been in tables and showed insignificant difference (p>0.05) **(Table-1)**



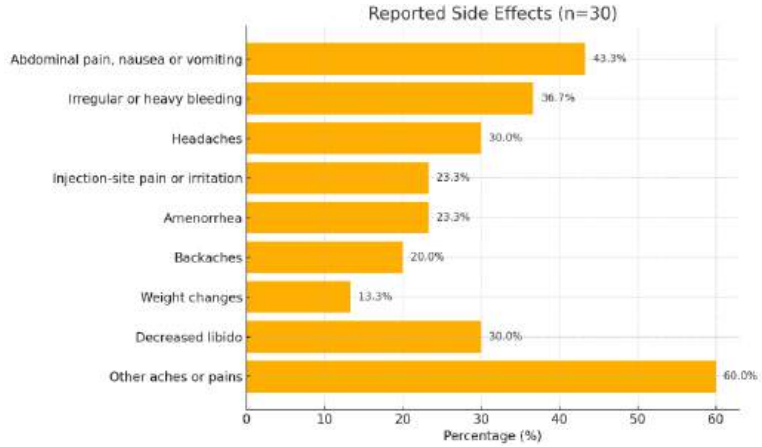




**Fig-1: Efficacy of treatment** **Fig-2: Frequency distribution of reported side effects**

**Table-2: Comparison of side effects with respect to parity**

| Parity | Side effect | | Total | p-value |
|---|---|---|---|---|
| | Yes | No | | |
| ***Nulliparous*** | 5 (22.7%) | 17 (77.3%) | 22 (100.0%) | 0.406 |
| ***Primiparous*** | 10 (28.6%) | 25 (71.4%) | 35 (100.0%) | |
| ***Multiparous*** | 15 (38.5%) | 24 (61.5%) | 39 (100.0%) | |
| **Total** | **30 (31.3%)** | **66 (68.7%)** | **96 (100.0%)** | |

## DISCUSSION

The utilization of injectable contraceptives has experienced a surge in popularity within the realm of contraceptive users, effectively curbing the occurrence of unintended pregnancies.10 Over the course of recent decades, there has been a gradual rise in the percentage of women of reproductive age who have successfully satisfied their need for family planning through the employment of modern contraceptive methodologies, including injectable contraceptives. This proportion has witnessed a notable increase, ascending from a value of 73.6% in the year 2000 to a percentage of 76.8% in the year 2020. Remarkably, within the span of a mere ten years, the usage of injectable contraceptives has witnessed a twofold augmentation, subsequently providing comprehensive protection for over 42 million women globally on an annual basis.[11-12] In particular, community health workers (CHWs) have emerged as a highly effective option for the provision of contraceptive services, particularly in rural areas where access to healthcare might be limited.[13] Consequently, this situation presents a substantial obstacle in effectively addressing and fulfilling the needs and preferences of women who desire family planning. As a

result, it is of utmost importance for health policymakers to critically reassess the various options for delivering injectable contraceptives, as it has increasingly become the favored method among women, thereby overshadowing other contemporary contraceptive methods.[14-15]

In the context of this particular study, the findings pertaining to the efficacy of Sayana Press revealed that it was successful in achieving the desired outcome in 66 individuals, which accounted for approximately 68.7% of the study population. Conversely, it is important to note that 30 individuals, constituting roughly 31.3% of the sample, experienced side effects as a result of using Sayana Press.[16] In a comprehensive study, it was found that a total of seventy-three participants, accounting for 9.7% of the overall population, encountered adverse events (AEs). The occurrence of two serious adverse events was documented, whereby one participant suffered from a stroke, which was considered possibly linked to the study product, and another participant experienced a leg fracture, which was determined to be unrelated to the study product. It is noteworthy that bleeding irregularities were reported by approximately 5.2% of the individuals among the frequently reported adverse effects by the participant included in the study.[17] However, a rising trend of case of amenorrhea was witnessed as the research progressed. It is fascinating that when follow up of these participants was carried out during the study, there was detectable trend showing that there is decrease in number of participants with heavy bleeding as compared to baseline. This implies that chance of heavy bleeding in the participants decrease as the study advances. For management and treatment of bleeding irregularities, this detection plays significant influence among the individuals involved in this study. This implies that among the participants of this research project, a significant variation in weight is encountered. In addition , at the month 12 visit a significant proportion of 69.4% participants experienced weight gain. This concluded that the study product is responsible for increase in weight gain of any significance among the individuals of study group.[18] Moreover, this research study also provide significant information regarding bleeding irregularities and weight gain which are beneficial in developing potential side effect and health association. In order to better understand the adverse effects of study product and its implication in health of individuals, it is important that further research should be conducted.[19]

Furthermore, an additional 4.9% of the subjects opted to discontinue the treatment due to their earnest endeavor to conceive a child. Moreover, a minuscule fraction of 0.7% reported the occurrence of irregular menstruation, while an identical percentage experienced the unpleasant sensation of pain at the injection site. In a subsequent study, an overwhelming majority of 71%

who underwent the Sayana press injection did not encounter any untoward side effects. It is worth noting that the findings of the current study are fully aligned with the outcomes of previously conducted research endeavors.[20]

Moving forward, it is imperative for future research endeavors to delve into the identification of steps that can be taken to effectively implement this practice on a larger scale. Additionally, further investigations should be conducted to explore the potential of administering alternative medications to enhance adherence and improve the overall health outcomes of individuals residing in local settings.

## CONCLUSION

The findings of the study revealed that Sayana Press, a contraceptive method, was deemed satisfactory by the women within our specific demographic. This information is of great significance as it not only offers valuable insights to the government, but also serves as a crucial steppingstone towards the potential implementation of Sayana Press. Furthermore, it prompts the government to contemplate the prospects of future research focusing on self-injection methods, thereby ensuring a comprehensive understanding of the topic.

## REFERENCES

1. Deese J, Brache V, Bahamondes L, Salinas A, Jorge A, Veiga N Jr, et al. Contraceptive effectiveness, pharmacokinetics, and safety of Sayana® Press when injected every four months: a multicenter phase 3 trial. E Clinical Medicine. 2022;44(1):101273.
2. Sherpa LY, Tinkari BS, Gentle P, Sah RK, Shrestha A, Sahani SK, Aryal K, Ghimire J, Karki DK. A prospective cohort study to assess the acceptability of Sayana Press among 18–49-year-old women in Nepal. Contraception. 2021;104(6):623-7.
3. Kennedy CE, Yeh PT, Gaffield ML, Brady M, Narasimhan M. Self-administration of injectable contraception: a systematic review and meta- analysis. BMJ Glob Health. 2019;4(1):e001350.
4. Beksinska M, Issema R, Beesham I, Lalbahadur T, Thomas K, Morrison C, et al. Weight change among women using intramuscular depot medroxyprogesterone acetate, a copper intrauterine device, or a levonorgestrel implant for contraception: Findings from a randomised, multi-centre, open-label trial. E Clin Med. 2021;34(1):100800.
5. Stout A, Wood S, Barigye G, Kaboré A, Siddo D, Ndione I. Expanding access to injectable contraception: results from pilot introduction of subcutaneous depot medroxyprogesterone acetate (DMPA-SC) in 4 African countries. Global Health Sci Pract. 2018;6(1):55–72.
6. Nai D, Tobey E, Fuseini K, Kuma-Aboagye P, Jain A. What distinguishes women who choose to Self-Inject? A prospective cohort study of subcutaneous depot medroxyprogesterone acetate users in Ghana. Global Health: Science and Practice. 2022;10(1):1-5.
7. Burke HM, Chen M, Buluzi M, Fuchs R, Wevill S, Venkatasubramanian L, Dal Santo L, Ngwira B. Effect of self-administration versus provider-administered injection of subcutaneous depot medroxyprogesterone acetate on continuation rates in Malawi: a randomised controlled trial. The Lancet Global Health. 2018;6(5):e568-78.

8. Riedel EM, Turner DT, Kobeissi LH, Karyotaki E, Say L, Cuijpers P. The impact of psychosocial interventions on condom and contraceptive use in LMICs: meta-analysis of randomised controlled trials. Glob Public Health. 2020;15(8):1182–99.
9. Schorge JO, Schaffer JI, Halvorson LM, Hoffman BL, Bradshaw KD, Cunningham FG. Contraception and sterilization. Williams gynecology. Columbus, OH: McGraw-Hill. 2008.
10. Mansour D, Gemzell-Danielsson K, Inki P, Jensen JT. Fertility after discontinuation of contraception: a comprehensive review of the literature. Contraception. 2011;84(5):465-77.
11.Burrows LJ, Basha M, Goldstein AT. The effects of hormonal contraceptives on female sexuality: a review. The journal of sexual medicine. 2012;9(9):2213-
11. Strauss JF, Barbieri RL, Dokras A, Williams CJ, Williams SZ, editors. Yen & Jaffe's Reproductive Endocrinology-E-Book: Physiology, Pathophysiology, and Clinical Management. Elsevier Health Sciences; 2023.
12. Falcone T, Hurd WW, editors. Clinical reproductive medicine and surgery: a practical guide. Springer; 2017. World Health Organization (WHO). Family planning/contraception methods. 2020 Nov 9. https://www.who.int/news-room/fact-sheets/detail/family-planning-contraception.
13. Tran NT, Seuc A, Tshikaya B, Mutuale M, Landoulsi S, Kini B, et al. Effectiveness of post-partum family planning interventions on contraceptive use and method mix at 1 year after childbirth in Kinshasa, DR Congo (Yam Daabo): a single-blind, cluster-randomised controlled trial. Lancet Glob Health. 2020;8(3):399-410.
14. Weidert K, Gessessew A, Bell S, Godefay H, Prata N. Community health workers as social marketers of injectable contraceptives: a case study from Ethiopia. Global Health Sci Pract. 2017;5(1):44–56.
15. United States Agency for International Development (USAID). Conclusions from the WHO technical consultation on expanding access to injectable contraception. 2014;1–2. Lotti F, Maggi M. Sexual dysfunction and male infertility. Nature Reviews Urology. 2018;15(5):287-307.
16. Lotti F, Maggi M. Sexual dysfunction and male infertility. Nature Reviews Urology. 2018;15(5):287-307.
17. Britton LE, Alspaugh A, Greene MZ, McLemore MR. An Evidence-Based Update on Contraception: A detailed review of hormonal and nonhormonal methods. The American journal of nursing. 2020;120(2):22.
18. Mangone ER, Lebrun V, Muessig KE. Mobile phone apps for the prevention of unintended pregnancy: a systematic review and content analysis. JMIR mHealth and uHealth. 2016;4(1):e4846.
19. Girum T, Wasie A. Return of fertility after discontinuation of contraception: a systematic review and meta-analysis. Contraception and reproductive medicine. 2018;3:1-9.
20. Deese J, Brache V, Bahamondes L, Salinas A, Jorge A, Veiga N, Fuchs R, Miller A, Taylor D, Halpern V, Dorflinger L. Contraceptive effectiveness, pharmacokinetics, and safety of Sayana® Press when injected every four months: a multicenter phase 3 trial. E Clinical Medicine. 2022;44.

# THE SPECTRUM OF SOCIO-ECONOMIC BARRIERS OF FAMILIES OF CHILDREN WITH CANCER DURING CROSS-BORDER CARE: A PAEDIATRIC TERTIARY CARE HOSPITAL EXPERIENCE

Alia Ahmad[1], Laeeq-Ur-Rehman[2], Asma Mushtaq[3], Amber Goraya[4], Aysha Akram[4], Mahvish Hussain[5]

1. Professor Paediatric Haematology/ Oncology, University of Child Health Sciences (UCHS), Children's Hospital Lahore Pakistan
2. Associate Professor Paediatric Neurosurgery UCHS, Children's Hospital Lahore
3. Assistant Professor Paediatric Ophthalmology UCHS, Children's Hospital Lahore
4. Associate Professors Paediatric Radiology UCHS, Children's Hospital Lahore
5. Associate Professor Paediatric Histopathology UCHS, Children's Hospital Lahore

**ARTICLE INFO**

**ORIGINAL ARTICLE**

**Corresponding author:**
Dr. Alia Ahmad, Professor Paediatric Haematology/ Oncology, University of Child Health Sciences (UCHS), Children's Hospital Lahore Pakistan
**Email:** alia_ahmad99@yahoo.com

**Vol: 3 | Issue:2**
ISSN Print: 2960-2580
ISSN Online: 2960-2599



**Publisher:**
Medical Research and Statistical Consultancy Training Centre (SMC-PRIVATE) Limited

**Author's contributions**
**Alia Ahmad:** idea conceptualization, write up
**Laeeq-Ur-Rehman:** Literature, data collection
**Asma Mushtaq:** Data collection
**Amber Goraya:** Literature review
**Aysha Akram:** Literature review
**Mahvish Hussain:** Literature review, write up

## ABSTRACT

**Background**: Childhood cancer care needs timely access to diagnostic, treatment, and follow-up services for better survival of these children. Unfortunately, there is a lack of established comprehensive childhood cancer centers in Afghanistan, so these children with cancer and blood disorders consult healthcare providers working cross-border to seek specialized care. The research to explore the distress linked with childhood cancer and associated socioeconomic hurdles is lacking in low-middle-income LMIC countries. **Objective**: To evaluate the challenges faced by these families while their children with cancer are being managed cross-border in Pakistan. **Methodology**: This is a cross-sectional study done at Children's Hospital Lahore, Pakistan, from 1st January 2023 to 31st March 2023. The study involved families with twenty-four children. We interviewed the Afghan families of these children to understand the challenges they faced during this ordeal. **Results**: The study included children with a mean age of 7.4 years; only 21% were females. They spoke Pushto and Dari languages. Twenty-five percent did not understand Urdu, finding communication exceedingly difficult in 50% of families. Only 4 families had the facility of a translator. Sixty-seven percent were diagnosed with acute lymphoblastic leukemia, and the rest with solid malignancies. The monthly family income was meager. In 85% of cases, the remaining family was sponsored by loans or charity, and 75% were escorted by one or both parents. Ninety-five percent took loans and had a significant effect on siblings education and emotional well-being. Eighty-five percent declared the economic difficulties more disturbing than communication and logistic challenges. **Conclusion**: During cross-border care, immense challenges were faced by them, requiring efficient socioeconomic support and parental support groups.

**Keywords:** Socio-Economic challenges, Childhood cancer, Cross-border care, Low-middle income countries

## INTRODUCTION

Childhood cancer care is being faced with multiple challenges due to poor access to early and correct diagnosis and treatment which is crucial for their better survival. Poor treatment outcomes

of children with cancer in low-middle-income countries (LMIC) result from defective mechanisms in their care pathways from diagnosis to referral for treatment, and follow-up.

The extent of missed diagnoses, under-diagnoses, or delayed diagnoses is directly connected to inadequate healthcare infrastructure and service delivery. Many LMICs have a paucity of trained multidisciplinary teams and reduced childhood cancer awareness, health education, and information among the public and healthcare professionals. These barriers are enhanced further by poor socioeconomic support and financial risk protection.[1]

The inequity in outcomes of children resulting from delayed detection, referral, diagnosis, and treatment in LMIC corresponds to global socioeconomic, health infrastructure, and trained workforce inequalities. Childhood cancer survival can be improved by gradually improving the quality, access, and coordination of healthcare services in all but mainly rural populations in LMICs.[2] The challenges of children with cancer from war and conflict areas during their diagnosis, treatment, and continuous care need to be addressed with the support of international communities and NGOs. To support the health of displaced people is a challenge shared by the health system in the host countries, intensified by their political instability and economic decline. These challenges were escalated with travel restrictions between countries during the COVID-19 pandemic. Although estimates of childhood cancer cases are not available, it is assumed that there is a high prevalence of advanced and unrecognized cancer cases in all age groups fleeing from low-income countries in humanitarian crises.[3]

The quality of life of these families of the children with cancer being treated in neighbouring countries should be enhanced by devising comprehensive family-centered care plans by the receiving countries. There are very few studies done in the region to explore these challenges experienced by these families while taking care of their children in the neighbouring countries.[4] Children's Hospital Lahore, offers Afghan children diagnosed with cancer, curative and palliative care services free of cost and they are never refused these services despite resource-constrained settings. Their survival is affected by the long travel times required to reach the primary treatment center in Lahore.[5] Armed conflict in Afghanistan has continued for over four decades resulting in destroyed health infrastructure in the country resulting in many Afghans seeking cancer care in neighboring countries including Pakistan.[6]

This study aims to deep dive these challenges faced by them during the course of their treatment. Unfortunately, established comprehensive childhood cancer care centers, forcing them to travel to other countries to explore treatment options, complicating further the cancer ordeal. Research on evaluation of distress linked with childhood cancer and psycho-social needs is deficient in this region except for few studies done in Iran, Jordan, and Turkey to explore these challenges faced by these families during cross-border childhood cancer care.

## MATERIALS AND METHODS

**Study design:** Cross sectional study

**Setting:** Paediatric Haematology/Oncology Unit, University of Child Health Sciences (UCHS), Children's Hospital Lahore Pakistan

**Duration:** The study was done from 1st January to 31st March 2023

**Sampling technique:** The sampling was done by a non-purposive convenient method and data was collected through face-to-face interviews based on a questionnaire developed and validated by two experts.

**Sample size:** 24 children

**Inclusion Criteria:**

Children of age 1-16 years old from cross-border and, on active chemotherapy for either leukemia or solid malignancies

**Exclusion criteria:**

1- Children with cancer on active treatment in Children's Hospital Lahore from Pakistani nationality

2- Children on follow-up care

3- Children on palliative care

**Data collection procedure**

The study was done by conducting interviews with Afghan caregivers of these children to explore their socioeconomic hurdles, financial and communication difficulties, and effect of this illness on these families and their hopes of cancer cure. Interviews were conducted with twenty-four families: fathers, grandfathers, elder brothers, or mothers of children under treatment aged 24–65. Their children were aged 2–16 years. Majority of the fathers were laborers, daily wagers, who were either illiterate or had elementary education. These children were diagnosed with Rhabdomyosarcoma, Acute lymphoblastic leukemia, or Wilms tumor. Approval from the Institutional Ethical Review Board was obtained prior to starting the study and consents obtained from the parents and caregivers for enrolment in the study. One of the fathers volunteered to provide the services of a translator free of cost throughout the interviews. Parents of those children actively treated were included and parents not willing for interviews were excluded. Interviews were conducted and data analysis done by SPSS 26.

## RESULTS

The study included children with mean age of 7.4±4 years and majority were males 79%. The main languages were Pushto (45%) and Dari (55%). Fifty percent understood considerably basic Urdu, 25% understood well and 25% did not understand at all. These families travelled from different states of

Afghanistan including Kabul, Herat, Jalalabad, Khust, Mizar shah, Ghazni, Baglan, Kandhar and others with a mean distance of 1340 Km.

**Table 1: Demographic profile of Afghan children with cancer (N=24)**

| Characteristics | Domain | Category | n (%) or Value |
|---|---|---|---|
| Demographic Profile | Age (years) | | 7.4 ± 4.24 |
| | Gender | Male | 19 (79.0%) |
| | | Female | 5 (21.0%) |
| | Mother Language | Pushto | 11 (45.0%) |
| | | Dari | 13 (55.0%) |
| | Number of siblings (median) | | 6 |
| | Monthly income (median) | | 10,000 PKR |
| | Diagnosis | ALL | 16 (67.0%) |
| | | Solid Tumors | 8 (33.0%) |
| | Youngest sibling age (mean) and median | | 3.8 years |
| | Distance to CHL (mean) and median | | 1340 KM and 1250 KM |
| | Total Travel Hours (mean) | | 27 Hours |
| | One Trip Cost (mean) | | 13,000 PKR |
| Communication Barriers | Understand Urdu | Little | 12 (50.0%) |
| | | Yes | 6 (25.0%) |
| | Converse Urdu | Yes | 3 (12.5%) |
| | Converse English | Yes | 0 (100.0%) |
| | Translator Available | Yes | 4 (16.6%) |
| | Communication Urdu | Very Difficult | 12 (50.0%) |
| | | Difficult | 9 (37.5%) |
| | | Not Difficult | 3 (12.5%) |
| | Barrier | Mild | 4 (16.6%) |
| | | Moderate | 6 (25.0%) |
| | | Severe | 14 (58.4%) |
| Impact on Family Dynamics | Accompanied by | Father | 11 (45.8%) |
| | | Mother | 1 (4.2%) |
| | | Parents | 6 (25.0%) |
| | | Elder Sibling | 6 (25.0%) |
| | Siblings care | Grandparents | 14 (58.4%) |
| | | Mother | 7 (29.1%) |
| | | Themselves | 3 (12.5%) |
| | Schooling | Affected | 12 (50.0%) |
| | | Stopped | 3 (12.5%) |
| | | No Effect | 5 (20.8%) |
| | | Not Schooling | 4 (16.7%) |
| | Expenses by | Themselves | 3 (12.5%) |
| | | Others | 21 (87.5%) |
| | Emotional | Neglected | 20 (83.4%) |
| | | Distressed | 4 (16.6%) |

Most of the children 67% were on ALL treatment, they needed to stay longer for the intensive phase of chemotherapy in contrast to solid tumors with a paucity of translation facilities with the healthcare providers' team. Table 1 depicts the effects on family dynamics due to the long stay of the child with cancer away from home accompanied by the main breadwinner of the family away from home, siblings' schooling, and compromised care of the rest of the family during this ordeal. The family dynamics are significantly affected financially, emotionally, and socially as shown by most of their families being dependent on relatives, neighbors, and community members for financial matters along with a marked effect on siblings' schooling during this duration. (Table 1)

Figure 1 shows the challenges these families have had in arranging a proper shelter for the patient and chaperons during the visits to Children's Hospital Lahore though most of these families were unable to afford to go back home sooner than a year. Figure 2 summarizes the financial burden and daily unmet needs of these families as 96% of families borrowed money at various times for daily expenses, food, and other needs.

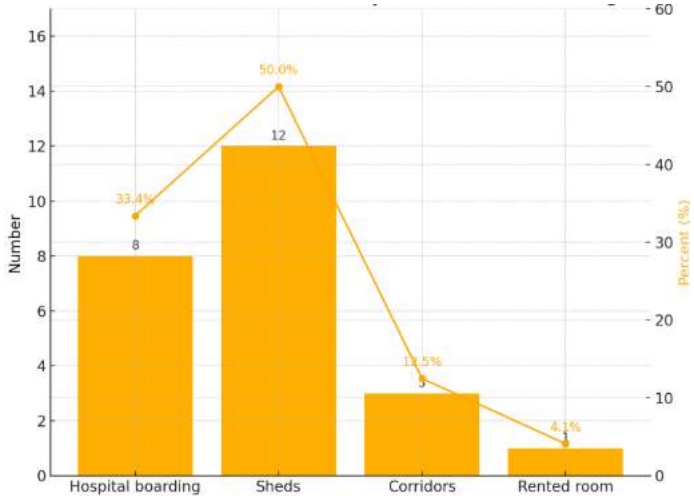



**Fig. 1: Family lodging**

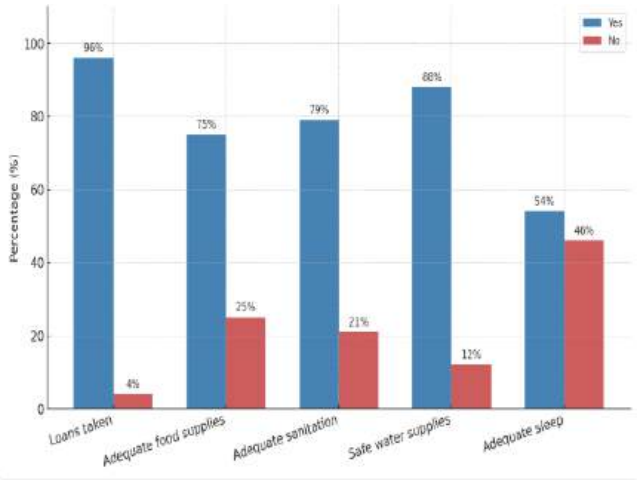



**Fig. 2: Household material hardships HMH**

## DISCUSSION

In the present study, these children had acute lymphoblastic leukemia (ALL) in 67% and solid malignancies in 33% of cases as was the case for refugee children <18 years from Syria and Iraq being treated in Turkey, Lebanon, and Jordan with Leukemia being most common among these children.[7] We analyzed the extent of challenges faced by these families travelling from Afghanistan to Lahore Pakistan to get treatment for their children diagnosed with cancer. These children were treated with equity with local children and provided all the treatment facilities free of cost and without any external funding provided by foundations as described in many studies done in Jordan,

Lebanon, and Turkey.[7] Syrian refugees in Turkey have access to cancer care services free of cost and after completion of the treatment course, they leave Turkey and go back to Syria as there is disrupted healthcare services locally, like Afghanistan due to ongoing war crisis in these countries. The increased diagnostic interval documented could be due to the migration and registration process, financial burden, and reduced health literacy.[8,9]

Childhood cancer results in increased psychological distress for families, directly associated with parents having children with cancer facing financial issues in Lebanon[10], requiring social support and coping strategies to maintain optimism and family integration compared to patients even treated in their own countries or abroad.[11] Parents need coping mechanisms to deal with Psychosocial and marital distress and impaired family functioning integrating social support and better communication for parental emotional problems.[12,1] There are multiple factors related to depression diagnosed among mothers of children having cancer were linked with social factors like marital status, parental literacy, income, children cancer diagnosis), and stress factors (care-giving burden, cancer-related and general stress) requiring emotion-focused coping and perceived social support and other suitable effective preventive approaches along the course of illness.[14,15] These families have had a median monthly income of only 10,000 Pak Rupees with a median number of six siblings and the youngest child of 3.8 years mean age and 29% of these children were accompanied by the mother and 58% were taken care of grandparents at home followed by mother (29%), and siblings (13%) indicating the extent of familial dynamics disruption and stress. In 50%of cases, siblings' schooling was affected and 13% stopped schooling due to this ordeal. 83% of the families claimed that the emotional well-being of family members back home has been affected and 17% feel distressed. Family domains were affected badly as 88% of families were financially dependent on relatives, neighbors, and community members for daily expenses and 71 % of siblings were taken care of by grandparents or themselves alone unsupervised by parents or relatives.

A study was done to identify the increased emotional stress faced by children with cancer, caused by multiple factors including lack of provision of psycho-social support as most patients come from faraway places with paucity of basic health facilities. Surprisingly the siblings showed better emotional health Pediatric Emotional Distress Score (PED) was less than 28 (mean 23.4), probably related to the joint family system with grandparents greatly involved in childcare. About one-third of siblings had their anxiety scores above the clinical threshold emphasizing the significance of psycho-social support to all family members including the children with cancer.[13] Siblings' resilience is well documented, but mechanisms should be explored to define and implement sibling support programs accessible to these families independent of socio-demographic factors like ethnicity, financial burden, and parental education to improve siblings' Psychosocial well-being.[14-16]

The psychological stress experienced by caregivers of children related to their diagnosis is well documented.[17] Domains of caregiver psychological adjustment ranging from depression, anxiety, and post-traumatic stress

symptoms and stress resulting from general life stress, child's treatment-related stress, their perceptions of treatment intensity, and life threat directly or indirectly related to cancer diagnosis.[18] A study done in Singapore demonstrated practical, emotional, and cognitive problems being related with distress in non-resident caregivers and these problems could arise being dislocated from their home country.[19] A study was done in Iran's public sector hospital for assessment of stress in mothers of children being treated for acute lymphoblastic leukaemia explored the relationship between the availability and satisfaction of social support and caregiver burden (CB) and described that the greater the social support, the lesser the burden for caregivers despite caring young children and prolonged treatment durations.[2]

Among these challenges, logistics travelling from different provinces to Lahore Pakistan with a mean travel of 1340Km (1250 KM median) and a mean travel time of 27 hours and one trip costing them 13000 PKR, while 35% of children and families travelled <200 Km and 56% families 200-500Km and only 9% had to travel >500Km to reach the primary treatment center in a study done in Lahore Punjab Pakistan.[16] There are many patients with cancer within Afghanistan who are currently forced to travel long distances to get treatment elsewhere. The arduous journey is due to ongoing conflict in different regions of Afghanistan. As they often travel with several relatives, increasing total expenses and resulting in family dynamics disruption back home. Pakistan Afghan border control /immigration process allows them to enter Pakistan for a limited period increasing their difficulties in completing long courses of treatment and follow-up and overall outcome assessments of patients including pediatric cohort (20.3%).[6]

Syrian refugees preferred to travel to Turkey where free treatment services were available in public sector hospitals for children with cancer though many also travelled to Jordan and Lebanon where they were obligated to pay treatment costs partially as they were exposed to disrupted healthcare in their own country due to war and armed conflicts since 2011. These children arrived in advanced stages of cancer due to multiple factors such as local inadequate healthcare services, poor referral pathways, communication barriers, inadequate transportation means, and reduced income to seek medical help. They documented inferior outcomes with overall survival less than Turkish children in the same hospitals.[9] Another study done in Jordan highlighted the increased load of children cancer in the displaced populations in Jordan and explored their dynamics and success of lifesaving initiatives for children being treated in Jordan displaced from Syria, Palestine, Iraq, and Yemen at The King Hussein Cancer Center (KHCC) and Foundation (KHCF) in partnership with the St. Jude Children's Research Hospital, treating 968 non-Jordanian children with cancer since 2011-2022. Such pediatric cancer care models and continued funding mechanisms are required for sustainable availability of cancer care services for displaced communities.[21]

The Household Materials Hardships (HMH) review revealed that 96% took loans despite this they were unable to have adequate lodging, appropriate food, safe portable water, and safe sanitation practices. 33% were able to get a

place in hospital boarding and the rest slept in sheds (50%) and corridors (12%), and only one family rented a room during their stay for the treatment course. Another study done in Children's Hospital Lahore described 58% of parents took loans and 68% borrowed money while treating their children with cancer.[16] One of the most consistent barriers to accessing healthcare facilities among stigma, culture, and communication was financial challenges with limited disposable incomes of these families requiring improved funding mechanisms by foundations currently focusing on the communicable disease spectrum of children globally need to be sought out to save more lives.[7,22] Atun et al[1] explored the current evidence on financial challenges related to childhood cancer globally, describing the current definitions and assessment, their components, and the extent of variations by country income. The domains of financial hardships reported included medical (clinical labs, procedures, and supportive care) and non-medical (accommodation, transport, travels, utilities, food, educational fee) out-of-pocket expenses, indirect costs (lost daily wages, income, jobs, neglecting children and household) various monetary coping mechanisms, psycho-social and behavioral trends, and adjustments in LMIC and compared with High-income countries (HIC). They concluded that there is an essential need to implement an evidence-based tools with validated interventions to devise effective policies enabling to tackle economic adversity in children cancer which is a leading factor towards poor health outcomes and survival disparities worldwide.[23]

Only12% of families were able to converse in Urdu,50% understood basic Urdu, and neither did they know English to communicate with hospital staff and a translator facility was available for only 16%. 50% found it very difficult to communicate in Urdu with healthcare providers and 37% moderately difficult. 58% perceived the communication barrier as severe, 25% moderate, and 17% mild. These families spoke either Pashto or Dari.[6] Studies done in Turkey for refugees from conflict countries showed that once these families reached there after a great ordeal, they faced many challenges like registration in an appropriate comprehensive healthcare facility, communication barriers, lodging, provision of good nutrition, and safe sanitation to children with cancer on treatment despite legal regulations in place from the local Governments.[7,9]

A huge incursion of resources is required to precisely evaluate the cancer burden and to facilitate improved comprehensive cancer care in LMIC having humanitarian crises. There are opportunities to upgrade cancer care in such situations, including empowering refugees and host community perspectives and developing a precise policy framework for cancer care in humanitarian conflict populations.[24] The long and challenging cancer journey of these patients, with uncertain follow-up courses is very irksome. The lack of a cancer healthcare capacity in Afghanistan after many years of conflict should promote initiatives to build infrastructure and strengthen health systems by policy makers to support post-conflict local, national, and cross-border cancer care.[25] Global Policymakers and politicians should identify and prioritize socioeconomic inequities strongly affecting cancer outcomes as a global public health issue, especially in places where these disparities are growing, bringing advanced

preventive and curative cancer interventions accessible to all.[26] According to one of the WHO report Afghanistan's health system is on the edge of collapse. There is a need for urgent action to be taken to prevent the country from facing an imminent humanitarian crisis and to identify methods to scale up health response by engaging stakeholders.[27]

## CONCLUSION

These families of children with cancer being treated cross-border are facing immense challenges requiring efficient Socio-Economic support and the need for the availability of dynamic parental support groups to lessen the severity of their long ordeals cannot be overemphasized.

## REFERENCES

1. Mahmood T, Salam A, Waseem I, Khalid A, Maqsood U. The Attitude of Physical Therapy Students Towards their Profession and Education in Punjab. Journal of Islamabad Medical & Dental College. 2022 Sep 28;11(3):182-7.
2. Mahmood T, Afzal MW, Waseem I, Arif MA, Mahmood W. Comparative effectiveness of routine physical therapy with and without instrument assisted soft tissue mobilization for improving pain and disability in patients with neck pain due to upper crossed syndrome. Annals of Punjab Medical College. 2022 Mar 31;16(1):45-50.
3. Jessup RL, Oates MJ, Johnston RV, Buchbinder R. Shockwave therapy for plantar heel pain (plantar fasciitis). The Cochrane Database of Systematic Reviews. 2019 Nov;2019(11).
4. Wearing SC, Smeathers JE, Urry SR, Hennig EM, Hills AP. The pathomechanics of plantar fasciitis. Sports medicine. 2006 Jul;36:585-611.
5. Hashmi R, Naeem L, Arif S, Habiba U, Irfan R, Zafar M. Frequency of Plantar Fasciitis among Females in Teaching Profession. Journal of Aziz Fatimah Medical & Dental College. 2020;2(2):53-7.
6. Dudoniene V, Balnytė M, Kuisma R. Comparison of static balance and gait between subjects with plantar fasciitis and age-matched controls. Journal of Back and Musculoskeletal Rehabilitation. 2022 Nov 10(Preprint):1-8.
7. Palomo-López P, Becerro-de-Bengoa-Vallejo R, Losa-Iglesias ME, Rodriguez-Sanz D, Calvo-Lobo C, López-López D. Impact of plantar fasciitis on the quality of life of male and female patients according to the Foot Health Status Questionnaire. Journal of pain research. 2018 Apr 27:875-80.

8. Latt LD, Jaffe DE, Tang Y, Taljanovic MS. Evaluation and treatment of chronic plantar fasciitis. Foot & ankle orthopaedics. 2020 Feb 5;5(1):2473011419896763.
9. Sandhu TB, Jamil A. Muscle energy technique versus passive manual soft tissue therapies on planter fasciitis: a systemic review. Pakistan Journal of Rehabilitation. 2023 Jul 6;12(2).
10. Sharma D, Rawat SK, Vadher S, Mani C, Shah F. Prevalence of Plantar Fasciitis Among Post Graduate Medical Students.
11. Hansen L, Krogh TP, Ellingsen T, Bolvig L, Fredberg U. Long-term prognosis of plantar fasciitis: a 5-to 15-year follow-up study of 174 patients with ultrasound examination. Orthopaedic journal of sports medicine. 2018 Mar 1;6(3):2325967118757983.
12. Rasenberg N, Bierma-Zeinstra SM, Bindels PJ, van der Lei J, van Middelkoop M. Incidence, prevalence, and management of plantar heel pain: a retrospective cohort study in Dutch primary care. British Journal of General Practice. 2019 Nov 1;69(688):e801-8.
13. Aiman U, Malik L, Zahoor a. pain and difficulty level in working females having plantar fasciitis of multan city: Pain & Difficulty in Working females with Plantar Fasciitis. Pakistan BioMedical Journal. 2022 Aug 31:46-50.
14. Sung KC, Chung JY, Feng IJ, Yang SH, Hsu CC, Lin HJ, Wang JJ, Huang CC. Plantar fasciitis in physicians and nurses: a nationwide population-based study. Industrial health. 2020;58(2):153-60.
15. Cornwall MW, McPoil TG. Plantar fasciitis: etiology and treatment. Journal of Orthopaedic& Sports Physical Therapy. 1999 Dec;29(12):756-60.
16. Arshad S, Sharif MW, Waseem I, Mahmood W, Ilyas HS. Individual and organizational barriers faced by physiotherapists in implementing evidence based practice-an analytical study. JPMA. The Journal of the Pakistan Medical Association. 2022 Oct;72(10):2030-3.
17. Khired Z, Najmi MH, Akkur AA, Mashhour MA, Bakri KA, Najmi M, Mashhour M, Bakri K. The prevalence and risk factors of plantar fasciitis amongst the population of Jazan. Cureus. 2022 Sep 21;14(9).
18. Pallavi S, Yamini S, Megha Y, Jyoti S, Mangalam K, Sakshi A. To Compare the Prevalence of Plantar Fasciitis among Females Wearing Flat Foot Wear and Heels in Young Adults. Indian Journal of Physiotherapy & Occupational Therapy Print-(ISSN 0973-5666) and Electronic–(ISSN 0973-5674). 2020 Apr 25;14(2):177-80.
19. Bhoir KS, GD VV. Prevalence of Plantar Fasciitis Among Nurses at a Tertiary Care Centre in a Rural

Area: A Cross Sectional Study. Int J Physiother Res. 2021;9(4):3900-06.

20. Abidin SZ, Haneef K, Malik NR, Mashal M, Zeb A, Rahman MU. Prevelance and Associated Risk Factors For Plantar Fasciitis Among Security Forces Personnel In Peshawar. Annals of Allied Health Sciences. 2019 Dec 31;5(2):20-3.
21. Binu MG, Iesa M, Vinodini C, Nizar A. Relationship of Prevalence of Plantar Fasciitis to the Type of Flooring-A Community Based Observational Study. Indian Journal of Public Health Research & Development. 2013 Apr 1;4(2): 54-56

# RISK ASSESSMENT OF CHRONIC VENOUS INSUFFICIENCY AND VARICOSE VEINS AMONG TEACHERS: PREVALENCE, PATTERNS, AND PERSPECTIVES IN SAHIWAL DIVISION, PAKISTAN

Ansar Ali Faraz[1], Waqas Makhdoom[2]
1. Department of Rehabilitation Sciences, Faculty of Allied Health Sciences, the University of Lahore,54000 Pakistan
2. Department of Statistics, Government College University Lahore, 54000 Pakistan

**ARTICLE INFO**

**ORIGINAL ARTICLE**

**Corresponding author:**
Ansar Ali Faraz: Department of Rehabilitation Sciences, Faculty of Allied Health Sciences, the University of Lahore,54000 Pakistan
**Email:** ansar.ali@drs.uol.edu.pk
**Vol: 3 | Issue:2**
ISSN Print: 2960-2580
ISSN Online: 2960-2599

**Publisher:**
Medical Research and Statistical Consultancy Training Centre (SMC-PRIVATE) Limited

**Author's contributions**
**Ansar Ali Faraz:** Main author, write up, data collection, data analysis
**Waqas Makhdoom:** Literature review, data collection

**Keywords:** Varicose veins, Risk factors, Long standing, Teacher, Occupation, Health education

## ABSTRACT

**Background:** The prevalence of varicose veins in the legs is commonly observed across the global population. However, the specific prevalence of varicose veins and the associated risk factors within the Sahiwal division are not clearly known. **Objective:** This study aimed at clarifying the risk factors for varicose veins among teachers in Sahiwal division. This study's objective was to evaluate the risk of varicose veins among teachers Sahiwal division, Pakistan. **Methodology:** Distributions of frequency and percentage were used to summarize the data. The t-test and chi-square test were used to assess statistical significance. This cross-sectional survey was carried out during February to April 2025 among teachers of both genders working in Sahiwal division's Primary, elementary, and high schools. **Results:** Mean age of both gender were 42.2 ± 2.06 years, 306 (51%) of the 600 participating instructors were male, while the remaining teachers were female. Pain in the legs increase especially during work (20.5%). The majority of participants (31.0%) had been employed for more than 15 years, and (41.0%) had been standing for fewer than five hours each day. Spider leg-shaped veins were the most noticeable symptom (24.2%). Swelling in the leg or ankle, was the common indicator (40.5%). 179 instructors in all had a family history of varicose veins; 84 of them (14.0%) had already received a varicose vein diagnosis. **Conclusion:** Obesity, family history, more than five hours standing is associated risk factor of chronic venous insufficiency and varicose veins among teachers that are above 45 years old. In summary, female educators who have a family history of varicose veins are at a higher risk of chronic venous insufficiency and varicose veins disease. Teachers in the Sahiwal division have a significant prevalence of varicose veins. This study indicates that teachers are far more likely to develop the disorder because of the way they work, which accelerates the condition's advancement.

## INTRODUCTION

The healthcare professionals frequently ignore chronic venous disease (CVD) because to a lack of understanding of the scope and severity of the issue, as well as an insufficient understanding of the different ways that primary and secondary venous illnesses show.[1] The number of people affected by CVD and the socioeconomic effects of its more severe symptoms are connected to the disease's

importance. The venous system of the lower extremities is affected by a disorder known as chronic venous insufficiency (CVI) which leads towards varicose vein problem.[2] The World Health Organization (WHO) describes varicose veins as long, dilated, and tortuous veins that typically appear in the legs. They may result in pain, discomfort, edema, heaviness, and occasionally problems such as blood clots or ulceration.[3] Though they are frequently seen as a cosmetic issue, they can also be an indication of underlying venous insufficiency, a condition in which the valves of veins are incompetent, causing blood to pool and internal pressure to rise. In the adult population, the estimated prevalence of varicose veins ranges from 5% to 30%. The male to female ratio is 3:1, while a more recent study suggests that the male prevalence may be higher.[4]

The Framingham Study provides an estimate of the growth rate of varicose veins, reporting a yearly incidence of 1.9% for men and 2.6% for women.[5-8] Varicose veins are more common in advanced, developed nations than in developing nations. Age, sex, obesity, pregnancy, a family history of varicose veins, phlebitis, and a history of leg injuries are risk factors that have been linked to CVI.[3] Varicose veins affect between 10% and 60% of people worldwide. As opposed to up to 30% in the West, this prevalence is higher in the Asian region.[9] The research study indicates that up to 62% of Saudi Arabians are affected, with a yearly increase in frequency of roughly 5% for women and 2% for men.[10]

According to a Mangalore study, 170 patients with varicose veins were admitted to tertiary medical facilities between May 2011 and April 2014.The age range of 41 to 50 years old accounted for the majority of cases (31.2%). There were 127 men (74.7%) and 101 unskilled workers (59.4%) in the majority. In 123 cases (72.4%), superficial veins were implicated.[11] The studies [11-14] also suggested that teachers had a 37.8% frequency of varicose veins, with a higher prevalence in female teachers. One possible cause of varicose veins in teachers could be long standing and insufficient sitting intervals.[13] in their study suggested that foam Sclerotherapy for chronic venous ulcers administered under ultrasound guidance has been linked to a high rate of healing and a low risk of recurrence.

The study based on the patients in Pakistan was conducted by[15] in surgical ward of the Mayo Hospital, Lahore. Most of the patients in our study were men; the male to female ratio for those with varicose veins was 3:1, and the majority of the men had either class 2 or class 5.

The p-value for the class of varicose veins and gender was 0.25, indicating that there was no significant association between the two variables. In their study they concluded that male patients in their study group had greater suffering than female patients. The incidence rate was similar for individuals of all ages. Our motivation to investigate the etiology of varicose veins came from the study of[16-18] Further investigation into the risk factors associated with female gender and career is necessary. In addition, we

now have more patients with varicose vein issues from Lahore, Rawalpindi, and Multan. We also collect data from people who have particular skin diseases and are dealing with varicose ulcers.

This study uses a multifaceted method that incorporates qualitative interviews, epidemiological data, and cultural assessments in order to provide a comprehensive picture of varicose vein. The ultimate goal of this research project is to improve the general health and quality of life for people in Punjab and beyond by providing evidence-based techniques for the prevention, diagnosis, and management of varicose.

**Material and Methods**

**Study design:** Observational, cross-sectional, and quantitative research design based on primary data collected through a face-to-face of the adult teacher's population

**Setting:** Sahiwal division

**Duration:** February to April of 2025

**Sampling technique:** study was carried out at 32 randomly chosen schools between (primary level 10, middle level 8, and High level 14)

**Sample size:** A total of 610 school instructors were selected to participate in the study. The participants included 310 men and 300 women.

**Sample selection criteria**

- **Inclusion criteria**

  Male and female instructors working in Sahiwal division, teaching any level age 25-59 years old.

- **Exclusion criteria**

Teachers who have taught for less than three years.

**Data collection procedure**

The study was started after approval from approval of Ethical committee of the Government College University's Research and Ethics Committee GCU-IIB-471]. Informed consent was obtained from all subjects involved in the study. The participants were given the questionnaire in person along with a leg examination. After gaining their consent, 610 school instructors in all were chosen for the study. Every participant received an explanation of the study's purpose. They had all of their questions and concerns answered before the questionnaire was given out. Six hundred and 610 subjects (310 men and 300 women) aged between 25-59 years were recruited. After excluding 10 subjects due to missing data, we analyzed the data of 600 participants (306 men and 294 women). This cross-sectional study was designed to examine the determinants of VV. The authors constructed a structured questionnaire based on the available literature regarding attitudes, perceptions, and behaviors for varicose veins; the questionnaire was divided into three parts:

Participants' age, gender, height, weight, and other personal and demographic data were gathered in the first section. The second section collected information about the workplace, such as employment responsibilities and length of service. Information about varicose veins, including symptoms and results from a physical examination of the legs, was covered in the third section.

Participants completed the questionnaire during in-person sessions. Following each completion, researchers probed their comprehension of the survey items to evaluate the instrument's face validity. After completing the questionnaire, the participants were also asked which questions they found unclear and the reasons for their confusion. Feedback from this pretesting phase was used to update and refine the questionnaire. The actual data collection was then carried out during February to April 2025 by three interviewers who were trained in face-to-face survey methodology. These interviewers used the updated questionnaire to conduct the interviews. Since the survey participants were volunteers recruited during the sampling stage, a total of 610 adults ultimately took part in the survey. This represented a very high response rate of 98%

**Measurement of risk factors**

The study evaluated several known risk factors for varicose veins, including sex, age, body mass index (BMI), family history, smoking, and prolonged upright standing posture at work. Through the questionnaire, the participants were asked about the number of hours they spent standing during their workday, as well as their occupation. Based on the duration of standing, the jobs were categorized into two groups: those where workers stood for 6 or more hours per day, and those where workers stood for less than 5 hours per day (with 5 hours being the median standing duration). Using these job categories, the study subjects were then divided into three groups based on their working conditions:

- Subjects who stood upright for prolonged periods (5 or more hours) without substantial movement.
- Subjects who stood for prolonged periods (5 or more hours) with substantial movement.
- Subjects who did not stand for prolonged periods (less than 5 hours).

This categorization allowed the researchers to assess the potential association between prolonged standing posture and the risk of developing varicose veins.

**Statistical analysis**

Distributions of frequency and percentage were used to summarize the data. The t-test and chi-square test were used to assess statistical significance. A multivariate logistic regression analysis was carried out to look more closely at the relationships. This made it possible to calculate odds ratios along with 95% CI. The p-value was deemed statistically significant if it was less than 0.05. The data was extracted, edited,

coded, and then imported into IBM SPSS Statistics version 29.0 for Windows[19] Teachers' body mass index (BMI), years of teaching experience, teaching grade, standing hours, and demographics were all included in the descriptive analysis. Additionally, data was compiled on instructors' smoking habits, medical history, and family history of varicose veins. The association and distribution of varicose vein symptoms along with years of teaching experience and standing hours were evaluated using cross-tabulation. This made it easier to determine the teachers' risk factors for varicose veins.

**Results**

**Table-1**demonstrates that 600 teachers who met the inclusion criteria in total filled out the survey questionnaire. The average age of teachers was 42.2 ± 2.06 years old, with a range of 25 to 59 years. Of these, 185 (30.8%) were primary school instructors, 212 (53.3%) were middle or intermediate school teachers, and 203 (33.8%) were high school teachers. 294 (49.0%) of the teachers were female, while 306 (51.0%) were male. In terms of years spent teaching, 103 (17.2%) had been teaching for three to six years, 137 (22.8%) for seven to ten years, 174 (20.0%) for eleven to fourteen years, and 186 (31.0%) for fifteen years and beyond. 354 people (59.0%) stood for six or more hours a day, compared to 246 people (41.0%) who stood for five hours or less. An exact of 253 (42.2%) were overweight and 182 (30.3%) were overweight. **Table 2** represents the medical and family history of varicose veins among teachers in Sahiwal division, Pakistan. A total of 179 (29.8%) teachers had a family history of varicose veins, 209 (34.8%) were diagnosed with varicose veins previously and 163 of teachers (27.2%) were smokers. **Table 3** shows that participants' reported symptoms of varicose veins include leg pain, which is more common during work (20.5%), leg cramps at night (18.5%), a heaviness in the legs (22.2), leg pain that is only relieved by medication (17.8%), and itching around the veins in the legs (28.5%). Total of (31.2%) teachers did not exhibit any indications of varicose veins. **Table 4** displays the indications of varicose veins found during the clinical evaluation of Sahiwal Division teachers. Spider leg-shaped veins were the most common sign (15.0%), followed by leg vein swelling and limp (28.3%), leg scar (21.7%), and change in leg skin color (35.2%). Other signs included eczema or rash on the legs (27.8%), leg or ankle swelling (40.5%), and pain when touching the leg veins (31.7%).

**Table 5** shows that the most commonly reported sign/symptom among teachers who stood for less than 5 hours per day was pain in the legs, especially during work, occurring in 32.1% of this group. This was found to be statistically significant.

In comparison, the most prevalent signs/symptoms among teachers who stood for 6 or more hours per day were swelling and visible varicose veins in the legs, reported by 22.9% and 22% of this group respectively. These findings were also statistically significant.

In summary, the distribution of varicose vein signs and symptoms differed based on the duration of standing during work. Teachers who stood for shorter durations (<5 hours) were more likely to experience leg pain, while those who stood for longer periods (≥6 hours) more commonly reported swelling and visible varicose veins in the legs. These differences were statistically significant. **Table 6** revealed several factors that were associated with the prevalence of varicose veins among the teachers, varicose veins were diagnosed in 23% of female teachers, compared to 14.8% of male teachers. This difference was statistically significant (p=0.037). Years of teaching experience: 24.5% of teachers who had been teaching for 12-15 years were diagnosed with varicose veins. This was significantly higher than the 8.8% rate observed among those who had been teaching for 4-7 years (p=0.048). Family history: 31.4% of teachers with a family history of varicose veins were found to have the condition themselves. This was substantially higher than the 11.6% rate among those without a family history. In summary, female sex, longer teaching experience, and a family history were identified as factors significantly associated with a higher prevalence of varicose veins among the teachers in the study.

**Table 7** shows our research finding, in the older group (≥45 years old), having a family history of VV was a risk factor; however, in the younger group (<45 years old), the effect was not statistically significant. In the older group, we observe that a significant risk factor for lower limb VV is having a family history. According to our research, the older group's(≥45 years old) prolonged standing at work did not have a statistically significant effect until they were standing for more than five hours every day. Standing for longer than five hours a day was similarly linked to an increased risk in the older group (OR = 2.31).

**Table-1: Participant personal information**

| Personal Info. | Frequency | Percentages % |
|---|---|---|
| **Grade** | | |
| Primary | 185 | 30.8% |
| Middle | 212 | 53.3% |
| High | 203 | 33.8% |
| **Age in Years** | | |
| 25-34 | 74 | 12.3% |
| 35-44 | 79 | 29.8% |
| 45-54 | 182 | 30.3% |
| 55 and above | 265 | 44.2% |
| **Gender** | | |
| Male | 306 | 51.0% |
| Female | 294 | 49.0% |
| **Teaching Years** | | |
| 3-6 years | 103 | 17.2% |
| 7-10 | 137 | 22.8% |

| | | |
|---|---|---|
| 11-14 | 174 | 29.0% |
| 15 and above | 186 | 31.0% |
| **Standing Hours** | | |
| Less or equal than 5 | 246 | 41.0% |
| Greater or equal than | 354 | 59.0% |
| **Body Mass Index** | | |
| Normal | 165 | 27.5% |
| Overweight | 253 | 42.2% |
| Obese | 182 | 30.3% |

**Table-2:**Varicose veins in the participants' medical and family histories

| Information | Frequency | Percentage % |
|---|---|---|
| **Diagnosed with VV** | | |
| No | 391 | 65.2% |
| Yes | 209 | 34.8% |
| **Smoking** | | |
| No | 437 | 72.8% |
| Yes | 163 | 27.2% |
| **Family History of VV** | | |
| No | 421 | 70.2% |
| Yes | 179 | 29.8% |

**Table-3:Participants' reported varicose vein symptoms**

| Symptoms | Frequency | Percentage % |
|---|---|---|
| Leg pain that is only treated with medication | 107 | 17.8% |
| Itching around the vein in the legs | 171 | 28.5% |
| Heat or itching around the legs | 89 | 14.8% |
| A feeling of heaviness in the legs | 135 | 22.5% |
| Legs cramps at night | 111 | 18.5% |
| Pain in the legs increase especially during work | 123 | 20.5% |
| None of these | 187 | 31.2% |

**Table-4: Clinical examination findings for varicose veins in the participants**

| Clinical analysis | Frequency | Percentage % |
|---|---|---|
| Leg Ulcer | 130 | 21.7 % |
| Leg Scar | 105 | 17.5 % |
| Swelling and limp in legs vein | 170 | 28.3 % |
| Spider legs shaped veins | 145 | 24.2 % |
| Change in the leg skin color | 211 | 35.2 % |
| Swelling in the leg or ankle | 243 | 40.5 % |

| | | |
|---|---|---|
| Pain when touching the leg vein | 190 | 31.7 % |
| No Signs Detected | 213 | 35.5 % |
| Eczema or rash | 167 | 27.8 % |

**Table-5: Information about standing hours and varicose vein symptoms**

| Teachers Standing Hours in a day | | | | | |
|---|---|---|---|---|---|
| Assessment | ≤ 5 Hours | % | > 6 Hours | % | P Value |
| No signs detected | 137 | 22.8% | 107 | 17.8% | 0.001 |
| Leg pain that only goes away by taking pain killers | 110 | 18.3% | 124 | 20.7% | <0.001 |
| A feeling of heaviness in legs | 93 | 15.5% | 155 | 25.8% | 0.014 |
| Legs Cramps at night | 140 | 23.3% | 189 | 31.5% | 0.052 |
| Pain in the legs increases especially during work | 193 | 32.1% | 210 | 35% | 0.001 |
| Symptoms of VV teachers had | 56 | 9.3% | 71 | 11.8% | 0.045 |
| Eczema or rash on the legs | 121 | 20.7% | 187 | 31.2% | 0.014 |
| Leg Ulcers | 103 | 17.1% | 201 | 33.5% | 0.002 |
| Swelling in the legs or ankle | 147 | 24.5% | 233 | 38.8% | 0.087 |
| Pain when touching the legs vein | 151 | 25.1% | 245 | 40.8% | 0.061 |
| Change in the leg skin | 122 | 20.3s% | 213 | 35.5% | 0.004 |
| None of these | 170 | 28.3% | 101 | 16.8% | 0.004 |

**Table 6: Varicose vein-related factors among the subjects**

| varicose veins Diagnostic | | | | | |
|---|---|---|---|---|---|
| Varicose Vein associated Factors | No | % | Yes | % | P Value |
| **Age In years** | | | | | |
| 25-34 years | 21 | 3.5% | 0 | 0% | 0.021 |
| 35-44 years | 34 | 5.6% | 23 | 3.8% | |
| 45-54 years | 198 | 33.0% | 45 | 7.5% | |
| 55 and above | 211 | 35.1% | 68 | 11.3% | |
| **Gender** | | | | | |
| Male | 219 | 36.5% | 87 | 14.5% | 0.045 |
| Female | 245 | 40.8% | 49 | 8.1% | |
| **Teaching in years** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 3-6 years | 35 | 5.8% | 14 | 2.3% | 0.077 |
| 7-10 years | 177 | 29.5% | 29 | 4.8% | |
| 11-14 years | 128 | 21.3% | 33 | 5.5% | |
| 15 and above years | 124 | 20.6% | 60 | 10.0% | |
| **Standing Hours** | | | | | |
| Less than or equal to 5 | 174 | 29.0% | 19 | 3.1% | 0.004 |
| Greater than 6 | 290 | 48.3% | 117 | 19.5% | |
| **Body Mass Index** | | | | | |
| Normal | 74 | 12.3% | 14 | 2.3% | 0.007 |
| Overweight | 157 | 26.1% | 55 | 9.1% | |
| Obese | 233 | 38.8% | 67 | 11.2% | |
| **Family History** | | | | | |
| Yes | 132 | 22.0% | 48 | 8.0% | 0.014 |
| No | 332 | 55.3% | 88 | 14.7% | |
| **Smoking** | | | | | |
| Yes | 274 | 45.6% | 55 | 9.17% | 0.001 |
| No | 190 | 31.6% | 81 | 13.5% | |

**Table7: Multivariate logistic regression among the factors of subjects related VV**

| Factors | Frequency | Odd Ratio | 95% Confidence I | P value |
|---|---|---|---|---|
| **Daily Standing Hours** | | | | |
| Less than or equa | 174 | 1.02 | 0.8-11.6 | 0.459 |
| Greater than 6 | 290 | 2.31 | 1.6-9.3 | 0.018 |
| **Teaching in Years** | | | | |
| 3-6 years | 35 | 7.4 | 4.3-18.1 | 0.237 |
| 7-10 years | 177 | 6.3 | 2.7-19.2 | 0.411 |
| 11-14 years | 128 | 11.9 | 5.4-23.7 | 0.013 |
| 15 and above yea | 124 | 9.6 | 6.1-23.5 | 0.021 |
| **Age in years** | | | | |
| 25-34 years | 21 | 9.1 | 3.2-21.8 | 0.681 |
| 35-44 years | 34 | 11.7 | 6.7-28.8 | 0.237 |

| | | | | |
|---|---|---|---|---|
| 45-54 years | 198 | 8.2 | 2.3-24.5 | 0.002 |
| 55 and above | 211 | 7.6 | 2.7-19.8 | 0.007 |
| **Gender** | | | | |
| Male | 219 | 10.9 | 5.4-26.3 | 0.074 |
| Female | 245 | 12.0 | 6.1-29.5 | 0.032 |
| **Family History** | | | | |
| Yes | 132 | 1.8 | 0.2-8.4 | 0.001 |
| No | 332 | 5.3 | 1.8-13.7 | 0.089 |
| **Body Mass Index** | | | | |
| Normal | 74 | 2.8 | 0.4-10.7 | 0.187 |
| Overweight | 157 | 4.3 | 1.9-17.5 | 0.041 |
| Obese | 233 | 5.9 | 2.4-21.6 | 0.002 |

## DISCUSSION

The prevalence of varicose veins, a prominent sign of vascular problems, is rising as a result of a number of factors, including age, sex, and extended standing. In this study, instructors from several schools in the Sahiwal division were asked to rate their risk of varicose veins. The study employed a cross-sectional design with questionnaires. The results showed that 30.3% of the participants were in the 45-54 age group, representing a relatively older population. In terms of gender, 51.0% were male and 49.0% were female. The majority of the participants (>15 years) had extensive teaching experience. Additionally, more than three-fourths of the teachers had a high body mass index (BMI). Previous diagnosis of varicose veins was reported by 18.5% of the participants. However, the study found a higher prevalence of varicose veins among teachers in the Sahiwal division compared to previous reports. This difference might be attributed to lifestyle and environmental factors that vary between different cities.

The study found that among the 21 teachers aged 25-34 years, none had been previously diagnosed with varicose veins (VV). In contrast, out of the 265 teachers aged 55 years and above who participated in the study, 211 (35.1%) were diagnosed with VV. The prevalence of VV diagnosis was slightly lower (33.0%) among the 45-54 age group, but the total number of teachers in the older age groups (45 years and above) was the highest in the study population. These findings align with the understanding that older age is a well-established risk factor for developing venous diseases. As individuals age, the calf muscles weaken, leading to increased pressure on the superficial veins. Additionally, the gradual deterioration of the vessel walls over time contributes to the higher prevalence of venous disorders in the elderly.[12] Supporting this,

a previous study in the United States found that the prevalence of VV was less than 1% in men and less than 10% in women younger than 30 years of age.[13]

Regarding the diagnosis of VV, there was a substantial difference in the current study between male and female professors. The proportion of male teachers with a diagnosis was 36.5%, while the for female teachers was 40.8%. In the study, female gender was thought to be a risk factor for VV.[13] According to multiple earlier researches, women are more likely than men to acquire VV.[14, 15] Pregnancy is a significant factor that raises the frequency of VV in women.[16]

The majority of teachers (124) had more than 15 years of teaching experience.20.6% of these long-serving teachers were diagnosed with varicose veins (VV). In contrast, only 5.8% of teachers with 3-6 years of experience were diagnosed with VV, the lowest percentage. However, the overall relationship between teaching years and VV diagnosis was not statistically significant. 48.3% of teachers who stood for more than 6 hours per day were diagnosed with VV. This was significantly higher than the 29% VV prevalence among those who stood for less than 6 hours per day.55.3% of teachers with a family history of VV were themselves diagnosed with the condition. This was substantially higher than the 22% VV rate among those without a family history Family history is an established risk factor for venous diseases, though the specific genetic links are not yet fully identified. The study found a statistically significant association between high body mass index (BMI) and the diagnosis of VV among the teachers.

In summary, while teaching experience did not show a significant link, other factors like prolonged standing, family history, and high BMI were identified as important risk factors for varicose veins in this population of teachers. The study did not include every school in the Sahiwal division, so the findings may not be fully representative of all teachers in the region. The measurement of standing hours and weight was based on self-reporting by the participants, which could lead to over- or underestimation of these factors. The participants did not undergo Doppler ultrasound examinations, which is an important objective method to diagnose vascular conditions like varicose veins.

## CONCLUSION

Varicose veins are a common condition, with a higher prevalence observed in females compared to males. Teachers, who spend extensive hours standing during their work, are particularly vulnerable to developing this condition.  these findings, further actions are needed to address this issue. Increase education and awareness among teachers about varicose veins through mass media campaigns and targeted outreach. Conduct additional research studies to gain a deeper understanding of the prevalence

and risk factors for varicose veins in the teaching profession. Explore interventions and preventive measures that can be implemented to reduce the incidence and complications of varicose veins among teachers. By taking these steps, the goal should be to decrease the burden of varicose veins and improve the overall health and well-being of teachers in the Sahiwal division and beyond.

**Funding:** This research received no external funding.

**Conflicts of Interest:** No conflicts of interest are disclosed by the writers.

**REFERENCES**

1. Shakya R, Karmacharya RM, Shrestha R, Shrestha A. Varicose veins and its risk factors among nurses at Dhulikhel hospital: a cross sectional study. BMC Nurs. 2020;19:8.https://doi.org/10.1186/s12912-020-0401-8

2. Wall R, Garcia G, Läubli T, Seibt R, Rieger MA, Martin B, et al. Physiological changes during prolonged standing and walking considering age, gender and standing work experience. Ergonomics. 2020;63(5):579-92.https://doi.org/10.1080/00140139.2020.1725145

3. Raetz J, Wilson M, Collins K. Varicose Veins: Diagnosis and Treatment. Am Fam Physician. 2019;99(11):682-8

4. Lin F, Zhang S, Sun Y, Ren S, Liu P. The management of varicose veins. Int Surg 2015;100(1):185-9

5. Al Shammeri O, AlHamdan N, Al-Hothaly B, Midhet F, Hussain M, Al-Mohaimeed A. Chronic Venous Insufficiency: prevalence and effect of compression stockings. Int J Health Sci (Qassim). 2014;8(3):231-6.https://doi.org/10.12816/0023975

6. Khanna AK, Kumar S. Venous scenario in India. Indian J Surg. 2023;85(Suppl 1):1-6

7. Ilyas I, Ashfaq HB, ul Ain Q. Prevalence of Varicose Veins Among Teachers in Lahore, Pakistan. PJPT. 2021;4(3):1-9

8. Jamil M, Usman R, Aman A, Ali K, Kharl RAK. Outcome Of Sclerotherapy In The Treatment Of Non-Healing Varicose Ulcers Under Ultrasound Control. J Uni Med Dent College. 2021;12(2):140-5

9. Shabbir MU, Shafiq MA, Salman A, Rafique A. Incidence of Various Types of Varicose Veins in Relation to Age and Gender Among Patients Presenting in Mayo Hospital. Pak J Med Health Sci. 2023;17(03):508-

10. Maziad M, Deek H. Prevalence of varicose veins among nurses working in different hospital departments: a cross sectional study. BAU J Health Wellbeing. 2021;3(2):1-9

11. Abou-ElWafa HS, El-Metwaly AAM, El-Gilany AH. Lower Limb Varicose Veins among Nurses: A Single Center Cross-Sectional Study in Mansoura, Egypt. Indian J Occup Environ Med. 2020;24(3):172-7.https://doi.org/10.4103/ijoem.IJOEM_264_19

12. Beebe-Dimmer JL, Pfeifer JR, Engle JS, Schottenfeld D. The epidemiology of chronic venous insufficiency and varicose veins. Ann Epidemiol. 2005;15(3):175-84.https://doi.org/10.1016/j.annepidem.2004.05.015

13. Kohno K, Niihara H, Hamano T, Takeda M, Yamasaki M, Mizumoto K, et al. Standing posture at work and overweight exacerbate varicose veins: Shimane CoHRE Study. J Dermatol. 2014;41(11):964-8.https://doi.org/10.1111/1346-8138.12643

14. Brand FN, Dannenberg AL, Abbott RD, Kannel WB. The epidemiology of varicose veins: the Framingham Study. Am J Prev Med. 1988;4(2):96-101

15. Jawien A. The influence of environmental factors in chronic venous insufficiency. Angiology. 2003;54 Suppl 1:S19-31.https://doi.org/10.1177/00033197030540O1s04

16. Kurz X, Lamping DL, Kahn SR, Baccaglini U, Zuccarelli F, Spreafico G, et al. Do varicose veins affect quality of life? Results of an international population-based study. J Vasc Surg. 2001;34(4):641-8.https://doi.org/10.1067/mva.2001.117333

17. Clark A, Harvey I, Fowkes FG. Epidemiology and risk factors for varicose veins among older people: cross-sectional population study in the UK. Phlebology. 2010;25(5):236-40.https://doi.org/10.1258/phleb.2009.009045

18. Vandy F, Wakefield T. Varicose veins: evaluating modern treatments, with emphasis on powered phlebectomy for branch varicosities. Interv Cardiol. 2012; 4 (5): 527-36. 2013.

19. IBM SPSS Statistics for Windows, Version 29.0; IBM Corp: Armonk, NY, USA, 2023.

# RISK FACTORS OF HYPERURICEMIA IN TYPE II DIABETES MELLITUS PATIENTS

Muhammad Kashif Shahzad Virk[1], Muhammad Yaqoob[2]
1. Additional Principal Medical Officer, Govt. Mian Munshi DHQ-1 Teaching Hospital Lahore
2. Associate Professor Department of Public Health, the University of Lahore, Pakistan

**ARTICLE INFO**

**ORIGINAL ARTICLE**

**Corresponding author:**
Dr. Muhammad Kashif Shahzad Virk, Additional Principal Medical Officer, Govt. Mian Munshi DHQ-1 Teaching Hospital Lahore
**Email:** drkashifvirk2013@gmail.com
**Vol: 3 | Issue:2**
ISSN Print: 2960-2580
ISSN Online: 2960-2599

**Publisher:**
Medical Research and Statistical Consultancy Training Centre (SMC-PRIVATE) Limited

**Author's contributions**
**Muhammad Kashif Shahzad Virk:** Main idea, write up, **Muhammad Yaqoob:** Supervisor, analysis

**Keywords:** Hyperuricemia, Type II diabetes mellitus, Body Mass Index, Lifestyle

## ABSTRACT

**Background:** Pakistan has an increased incidence of type II diabetes mellitus, a serious national health problem. Hyperuricemia, which is marked by increased Serum Uric Acid (SUA) levels, often goes along with diabetes mellitus type II and raises the threat of Kidney disease, BMI, dietary intake, and other comorbid diseases all contribute significantly to hyperuricemia. The research on hyperuricemia among Pakistani diabetic type II patients is very little. **Objectives:** To identify the associated risk factors of hyperuricemia in type II diabetes mellitus. **Method:** An Analytical Cross-Sectional Study was conducted at Government Kot Khwaja Saeed Teaching Hospital Lahore, involving 362 participants recruited through convenient sampling over 9 months. Patients aged 30–60 with type II diabetes mellitus for at least one year were included, while those with type I or gestational diabetes, known patient of hyperuricemia, relevant medication use, or unwillingness to participate were excluded. **Results:** Key results show that 69.6% of patients had no hyperuricaemia levels, while 30.4% had hyperuricemia. The mean uric acid level ranged from 2.90 to 9.30 mg/dL, with an average of 5.60 ± 0.75 mg/dL. Female gender is the strongest indicator of hyperuricemia, while BMI, diabetes duration, glycemic control, and comorbidities showed no correlations. Hyperuricemia was highly prevalent among housewives, indicating potential lifestyle factors. These findings stress the need for focused treatments, especially for women, to reduce hyperuricemia risks in TDM II female patients. **Conclusion:** This study reveals that female gender, height, housewives, low saturated fat foods and eating of the lean meats (poultry, fish, eggs etc.,) are the strongest predictor of hyperuricemia, with higher prevalence and odds. Factors like duration of diabetes mellitus in years, glycemic control, BMI and comorbidities showed no significant associations. Housewives exhibited a higher prevalence, suggesting lifestyle-related influences. These findings emphasize the need for targeted measures among females to reduce hyperuricemia risks and complications.

## INTRODUCTION

Diabetes mellitus is considered as a chronic metabolic condition and caused by the presence of high glucose levels in the blood has remained a significant health challenge in the world. The major causes of the increased prevalence of diabetes are lifestyle changes, urbanization, population aging [1]. In 2021, type 2 diabetes mellitus (T2DM) affected almost 536.6 million individuals worldwide and the same issue is expected to grow to 783.2 million by 2045 [2].

Out of the many complications related to T2DM, a synergistic relationship between metabolic abnormalities, and the high concentrations of uric acid referred to as hyperuricemia, have been identified as major determinants of disease progression [3]. Non-traditional DM marker is uric acid which is a product of purine metabolism. Recently, there has been growing evidence of the existence of a relationship between serum uric acid and DM, however, it still remains unclear [4].

Since T2DM is a metabolic disease, it usually makes it hard in patients to metabolize uric acid and results to HUA, but its presentation is less evident, especially in diabetic patients [5]. Whether it is a DM risk marker or independent risk factor remains unknown, since hyperuricemia is commonly linked to well-known DM risk factors, obesity, high fructose content in diet, and alcohol drinking [6].

Hyperuricemia was previously reported in diabetic patients to have a poor prognosis associated with high mortality and likelihood to face diabetes complications which include nephropathy, retinopathy and neuropathy [7]. As per the recent studies, the prevalence rates of hyperuricemia have been recorded to be different, among T2DM patients in various regions. In a cross-sectional study performed in North-western Tanzania, it was recorded that 44.4 percent of diabetic patients were hyperuricemic; the values were greater among female and patients with obesity, chronic kidney disease, or more prolonged duration of diabetes [8]. In a like manner, a local retrospective study has revealed that 8.8 percent of patients had hyperuricemia. It was also strongly related with an increased duration of diabetes and nephropathy. The majority of patients had poor glycemic control (74.2%) [9]. In other local studies, it has been noted that the levels of SUA and the complications of microalbuminuria and poor indicators of diabetes control such as HbA1c, fasting glucose, and albumin-to-creatinine ratio (ACR) are strongly linked [10,11]. Despite a growing body of evidence, inconsistencies exist in the strength and direction of associations with factors such as age, gender, diabetes duration, body mass index (BMI), HbA1c, and renal parameters like microalbuminuria. For instance, while some studies report a stronger correlation of SUA with female gender and older age

Although there is an increasing body of evidence, inconsistencies exists in magnitude and direction of associations with factors like age, gender, diabetes duration, body mass index (BMI), HbA1c, microalbuminuria and other renal parameters. As an example, although some authors indicate that SUA is increased during older age and female gender [12], other studies claim that male sex and obesity are more predictable [13]. Thus, a thorough assessment on the issue of hyperuricemia and its risk factors that vary among individuals with T2DM especially in underrepresented local populations is necessary and this research is intended to determine the risk factors of hyperuricemia in the population with T2DM.

## MATERIALS AND METHODS

**Study Design:** Analytical Cross- sectional.

**Study Setting:** Government Kot Khwaja Saeed Teaching Hospital, Lahore.

**Study Duration:** 09 months after the acceptance of Study Proposal.

**Sample Technique:** Non-probability convenient sampling.

**Sample Size:** The study sample was calculated by using proportion of adult population with hyperuricemia which is 38% in parent article [14]. The sample size for the current study (n) calculated 362 individuals by using open epi calculator.

**Sample selection Criteria**:

**Inclusion Criteria**:

- Patient with type II, Diabetes Mellitus.
- Either gender, age ranged from 30 to 60 years older with type II diabetes mellitus were included.
- Duration of DM-II at least of 01 years.

**Exclusion Criteria:**

- Diabetic Patients with Type 1, Gestational diabetes mellitus and who were taking medications / drugs which can affect the uric acid metabolism were excluded from the study.
- Known cases of hyperuricemia were excluded from the study.
- Subjects who are not willing to take part in the current research were excluded.

**Data Collection procedure**

Permission was obtained from the ethical board of the University of Lahore and hospital authorities at the Diabetic Clinic, Government Kot Khwaja Saeed Teaching Hospital Lahore (GKKSTHL). Patients were enrolled based on inclusion and exclusion criteria. Each patient was approached directly by the principal investigator (PI), and oral/written consent was obtained. Information was recorded on a predesigned questionnaire divided into three parts: (1) Socio-demographic factors, (2) Other relevant information, (3) Dietary scale. Weight (kg) and height (meters) were recorded to calculate BMI (kg/m²) using the standard formula. According to Asian classification: Underweight <18.5, Normal 18.5–22.9, Overweight 23–24.9, Obese I 25–29.9, Obese II ≥30. Lab tests included Blood Glucose, HbA1c, Uric Acid, and USG KUB when needed. Dietary intake was evaluated using the Healthy Unhealthy Eating Behavior Scale (HUEBS) by Gurtine C. (2020) [15], consisting of 22 items (11 healthy, 11 unhealthy), rated on a 7-point Likert scale (Cronbach's Alpha = 0.87, cut-off score = 77).

In the current study, Diabetes Mellitus was defined as having Glycosylated Hemoglobin (HbA1c) ≥ 6.5%, a Blood Sugar Level of Fasting (BSF) ≥ 110 mg/dL, and a random blood sugar level between 160-200 mg/dL [14]. Hyperuricemia was described as an increased level of Serum Uric Acid (SUA), often > 5.7 mg/dL in females and > 7.0 mg/dL in males, with cut-off values of SUA being 2.5-5.7 for females and 3.4-7.0 for

males. Uric acid levels and USG KUB were conducted to rule out Hyperuricemia in the adult population. Body Mass Index (BMI) was used to show the accumulation of adipose tissue in the body.

Dietary intake of different food items was measured by assessing the food intake over the last 24 hours, which defined a person's routine dietary intake, with full nutrition requiring a specified number of calories. The dietary intake in the current study was measured using the Healthy & Unhealthy Eating Behavior Scale (HUEBS), where the minimum score was 22, the maximum score was 154, and the cut-off value was 77 [15]. IBM SPSS 25 was used for data entry and analysis. Descriptive analysis assessed frequencies, while means ± SD were reported for continuous variables. Chi-square tested associations between categorical variables. Logistic regression identified predictors of hyperuricemia, presenting odds ratios. A p-value ≤ 0.05 was considered statistically significant.

**RESULTS**

Among the males, 9 out of 153 (8.2%) had hyperuricemia. Among the females, 101 out of 209 (91.8%) had hyperuricemia. The p-value for males is 0.438, which is greater than 0.05, indicating that there is no statistically significant association between hyperuricemia and being male. The p-value for females is 0.001, which is less than 0.05, suggesting that there is a statistically significant association between hyperuricemia and being female. The higher prevalence of hyperuricemia in females compared to males is statistically significant ($p = 0.001$). However, for males, the association is not significant ($p = 0.438$), meaning hyperuricemia occurrence among males may be due to chance rather than a true difference. The chi-square test results suggest that gender plays a significant role in hyperuricemia prevalence, with females being more likely to have hyperuricemia compared to males. However, hyperuricemia among males does not show a strong statistical association.

The duration of Type II diabetes mellitus (T2DM) did not significantly differ between groups ($p = 0.816$), with a mean of 6.23 ± 3.99 years in the non-hyperuricemic group and 6.06 ± 3.23 years in the hyperuricemic group. Median durations were 5.0 years and 6.0 years respectively. As expected, uric acid levels were significantly higher in individuals with hyperuricemia (6.20 ± 0.51 mg/dl) compared to those without (5.25 ± 0.69 mg/dl), ($p < 0.001$), with respective medians of 6.0 mg/dL and 5.40 mg/dL. HbA1c levels were similar between groups ($p = 0.185$), with means of 10.10 ± 1.19 and 10.22 ± 1.33, and medians of 10.20 and 10.30 for non-hyperuricemic and hyperuricemic individuals, respectively.

The total HUEBS score was slightly lower in individuals with hyperuricemia (58.75 ± 9.19) compared to those without (60.06 ± 8.37) ($p = 0.054$), but the difference was not statistically significant. Among the healthy dietary practices, the intake of low-saturated fat foods and lean meats (poultry, fish, eggs) revealed

statistically significant associations with hyperuricemia, with p-values of 0.018 and 0.026 respectively. This indicates that individuals who rarely or never consume such foods are more likely to present with hyperuricemia, suggesting a potential protective role of these dietary choices.

Conversely, other healthy behaviors such as frequent consumption of fruits, vegetables, whole grains, unsaturated fat foods, natural sweeteners, and boiled or grilled foods did not show statistically significant differences between hyperuricemic and non-hyperuricemic individuals ($p > 0.05$). Similarly, high water consumption, although prevalent among both groups, did not demonstrate a significant impact. In terms of unhealthy dietary behaviors, none of the listed items including the consumption of refined grains, artificial sweeteners, snack foods, sugar-sweetened beverages, deep-fried foods, pre-packaged meals, processed meats, added salt, fast food, baked goods, or alcohol exhibited statistically significant associations with hyperuricemia (all $p > 0.05$). This suggests that while these items may contribute to general poor dietary quality, their direct link to hyperuricemia in this cohort was not supported by the data.

Overall, the findings emphasize the importance of incorporating "lean proteins and low-saturated fat foods" in the diet as potentially modifiable factors in managing or preventing hyperuricemia. However, further longitudinal or interventional studies may be required to establish causal relationships and clarify the role of other dietary components. Using univariate logistic regression, it was found that female gender was the strongest predictor of hyperuricemia, with females being 8.64 times more likely to have hyperuricemia than males ($p < 0.001$, OR = 8.637, 95% CI: 3.24–43.28). Other variables, including age, BMI, education, diabetes duration, and glycemic control, were not significant predictors. After adjusting for all confounders, the final logistic regression model for predicting hyperuricemia identified gender as a significant predictor. The regression coefficient (B = 2.706) for females indicates a strong positive association with hyperuricemia. The adjusted odds ratio (OR = 14.963, 95% CI: 7.240 – 30.926, $p < 0.001$) suggests that females have approximately 15 times higher odds of developing hyperuricemia compared to males, and this association is highly significant. The constant (B = -5.478, $p < 0.001$) indicates the baseline odds of hyperuricemia in the absence of predictor variables. These findings suggest that gender plays a crucial role in hyperuricemia risk, with females being significantly more likely to develop the condition.

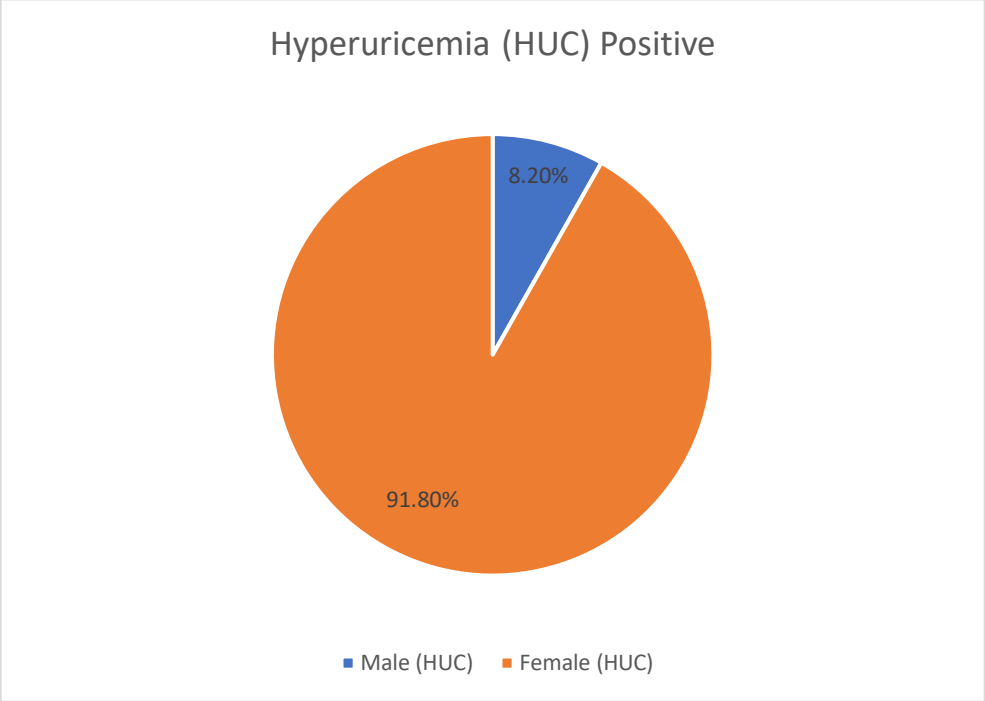



**Figure 1:** Comparison of Hyperuricemia Positive prevalence between males and females Shows 91.8% of hyperuricemic patients are female and 8.2% are males.

**Table 1:** Comparison of gender, clinical profiles and dietary habits with respect to hyperuricemia

| Variables | Category/Stats | Hyperuricemia: Yes (n=110) | Hyperuricemia: No (n=252) | p-value |
|---|---|---|---|---|
| **Gender** | Male | 9 (8.2%) | 144 (57.1%) | 0.438 |
| | Female | 101 (91.8%) | 108 (42.9%) | 0.001 |
| **Duration of Type II DM (years)** | Mean ± SD | 6.06 ± 3.23 | 6.23 ± 3.99 | 0.816 |
| | Min–Max | 1–15 | 1–24 | |
| **Glycemic Control** | Uncontrolled | 95 (86.4%) | 211 (83.7%) | 0.524 |
| | Controlled | 15 (13.6%) | 41 (16.3%) | |
| **HbA1c** | Mean ± SD | 10.22 ± 1.33 | 10.10 ± 1.19 | 0.185 |
| | Min–Max | 6.8–13.5 | 6.8–13.7 | |
| **Associated Diseases** | None | 67 (60.9%) | 129 (51.2%) | 0.153 |
| | Hypertension | 10 (9.1%) | 25 (9.9%) | |
| | IHD | 27 (24.5%) | 66 (26.2%) | |

| | | | | |
|---|---|---|---|---|
| | Others | 0 (0%) | 9 (3.6%) | |
| | Multiple | 6 (5.5%) | 23 (9.1%) | |
| **Total HUEBS Score** | Mean ± SD | 58.75 ± 9.19 | 60.06 ± 8.37 | 0.054 |
| | Min–Max | 43–80 | 40–83 | |

**Highly Significant, *Significant

**Table 2:** Results of Logistic Regression for prediction of hyperuricemia

| **Univariate logistic Regression for prediction of hyperuricemia** | | | | | | |
|---|---|---|---|---|---|---|
| | **B** | **S.E.** | **P-value** | **Unadjusted Odds ratio** | **95% C.I. for EXP(B)** | |
| | | | | | **Lower** | **Upper** |
| **Gender** | 2.962 | 0.411 | <0.001 | 19.335 | 8.637 | 43.283 |
| **Age (years)** | 0.011 | 0.021 | 0.616 | 1.011 | 0.970 | 1.053 |
| **BMI** | -0.025 | 0.025 | 0.323 | 0.975 | 0.928 | 1.025 |
| **Education (years)** | -0.030 | 0.031 | 0.338 | 0.971 | 0.914 | 1.031 |
| **Occupation** | 0.138 | 0.183 | 0.449 | 1.148 | 0.803 | 1.643 |
| **Monthly income (k)** | 0.000 | 0.011 | 0.979 | 1.000 | 0.978 | 1.022 |
| **Marital status** | -0.280 | 0.203 | 0.169 | 0.756 | 0.508 | 1.126 |
| **Family size** | 0.015 | 0.029 | 0.601 | 1.015 | 0.959 | 1.074 |
| **Type of housing** | 0.056 | 0.284 | 0.845 | 1.057 | 0.606 | 1.845 |
| **Other diseases** | -0.211 | 0.114 | 0.064 | 0.810 | 0.648 | 1.012 |
| **Family type** | 0.029 | 0.316 | 0.926 | 1.030 | 0.554 | 1.913 |
| **Duration of type II DM (years)** | -0.021 | 0.040 | 0.610 | 0.980 | 0.905 | 1.060 |
| **Family history of DM (Diabetes Mellitus)** | 0.675 | 0.427 | 0.114 | 1.964 | 0.850 | 4.535 |
| **Glycemic Control** | -0.088 | 0.383 | 0.819 | 0.916 | 0.432 | 1.942 |
| **Constant** | 12.604 | 4019 3.292 | 1.000 | | | |

**Table 4:** Final Logistic regression model for prediction of hyperuricemia

| **Final Logistic regression model for prediction of hyperuricemia** | | | | | | |
|---|---|---|---|---|---|---|
| | **B** | **S.E.** | **p-value** | **Adjusted OR** | **95% C.I. for EXP(B)** | |
| | | | | | **Lower** | **Upper** |
| **Gender \| Female** | 2.706 | 0.370 | <0.001** | 14.963 | 7.240 | 30.926 |
| ***Constant*** | -5.478 | 0.701 | <0.001** | 0.004 | | |

## DISCUSSION

This study aimed to identify risk factors to hyperuricemia in a sample of patients with type II diabetes mellitus and paying special attention to the dietary and demographic factors. Though the other factors such as the duration of diabetes, glycemic control and poor diets did not demonstrate significant statistical correlation, it is revealed that the female gender was the strong predictor of hyperuricemia.

We found that prevalence of hyperuricemia was considerably higher among females (91.8%) compared to males (8.2%) whereas the difference between their prevalence was significant statistically (p = 0.001). Logistic regression analysis revealed that the likelihood of women developing hyperuricemia was nearly 15 times higher in comparison with men (OR = 14.96, 95% CI: 7.24-30.92). This is proven by some of the international researches. A cross-sectional study conducted in Tanzania found out that out of 360 respondents consulted, the proportion of females was 59.7 percent. Mean serum uric acid level in female was 385 +/- 119 mu mol / L. The research established a close relationship between hyperuricemia and the female gender (P =.001), thereby indicating that female women afflicted with T2DM were at higher risks of being afflicted by hyperuricemia relative to their male counterparts [8].

Another study found, consistently, that women over 45 had hyperuricemia and that of centrally obese people [16]. In another cross- sectional study involving 655 of patients with diabetes type 2 in Jordan, gender was also significant with reference to hyperuricemia; the female had higher chances of having hyperuricemia (OR: 2.37; 95% CI: 1.63 3.45) as compared to males. This is to highlight that women with diabetes are more burdened with hyperuricemia [12].

Many studies, on the contrary, found increased levels of uric acid in men and premenopausal woman, in whom estrogen is believed to stimulate uric acid excretion. Even in a cross-sectional study of 1577 diabetic patients in Chengdu, the frequency of hyperuricemia, in fact, was remarkably higher among the men (29.35 percent) than in the women (13.03 percent) [13]. Local or regional dietary patterns, body composition, postmenopausal status, or genetic predisposition, however, could help to explain the higher sensitivity among women in our cohort.

Remarkably, the time since the development of diabetes and HbA1c were not linked to hyperuricemia (p = 0.816 and p = 0.185, respectively), implying that failure to manage glycaemic index, on its own, may not predict hyperuricemia among these individuals. Nonetheless, the research studies showed a close correlation of the serum uric acid and HbA1c levels. A cross-sectional study conducted in Cameroon reported that hyperuricemia was not significantly correlated with uncontrolled diabetes (p=0.095); nevertheless, a significant positive association was also found between serum uric acid and HbA1c (r=0.318, p=0.002) [16]. Also, this was undertaken in a large cross-sectional study of 30,772 participants looking at the linkage of HbA1c, hemoglobin glycation index (HGI) with serum uric acid (SUA) associated both by gender and diabetes status. It was found that HGI and HbA1c were positively related to the level of SUA in the women without diabetes. On the contrary, HbA1c had an inverse connection with SUA in people with diabetes among both genders. In non-diabetic men, SUA was in the shape of a bell curve in relation to HbA1c- levels, increasing to 5.7 percent and decreasing after this level. This information indicates the existence of complicated, sex-specific associations between glycemic markers and uric acid, thus implying that glycemic regulation can interact with the risk of hyperuricemia in diabetic and non-diabetic people in various ways **[17]**. The classification criteria we applied was proven correct in our study where the serum uric acid level was much higher (mean = 6.20 U +/-0.51 mg/dL) in the hyperuricemic group when compared to the non-hyperuricemic group (mean = 5.25 U +/-0.69 mg/dL). Furthermore, HUEBS score, assessing the compliance with the healthy lifestyle and diet, did not vary significantly across the groups (p = 0.054), but had shown the trend toward higher levels in non-hyperuricemic patients. On the contrary, a recent study revealed that healthier lifestyle score (HLS) was strongly linked to the lower serum uric acid (SUA) levels and the decreased risk of hyperuricemia (OR: 0.82; 95% CI: 0.77-0.86). Further, SUA mediated (13.06%) the association between a healthy lifestyle and a decrease in the risk of type 2 diabetes, which confirmed the involvement of SUA as a possible metabolic mediator [18].

Only two of the dietary habits; intake of lean proteins (poultry, fish, eggs) and low-saturated fat food; demonstrated a statistically significant protective effect toward hyperuricemia with p = 0.026 and p = 0.018 respectively. This implies that the daily consumption of healthy sources of proteins and fat-regulated food could reduce the chances of high serum uric acid. This is in favor with past literature which raised the importance of diet especially purine content and fat consumption in uric acid metabolism. These findings are in line with previous studies that indicated that greater adherence to the DASH diet was strongly linked with low numbers of serum uric acid (**β** = -0.11; 95 percent CI = -0.12, -0.10; p < 0.001) and decreases odds of hyperuricemia (OR = 0.85; 95 percent CI = 0.83, 0.87; p < 0.001) in Chinese population **[19].** Equally, an increased compliance to the DASH diet was linked to the rapid reduction of SU levels (P < 0.01), whereas a

one-point elevation in the DASH score was correlated to 4.3 percent reduced risk of spiking up on uric acid levels (IRR: 0.957; 95% CI: 0.938-0.977). These data lead to the recommendation of the contribution of the DASH diet as a preventive and intervention strategy to hyperuricemia [20].

Unexpectedly, there were no great links to conventionally unhealthy food constituents, such as sugar-sweetened drink, fast food, refined cereal, and processed meat. Beneficial effects supposedly contributed by high water intake, which is used to facilitate excretion of uric acid, did not have a significant correlation either, probably because of standard consumption rates exhibited by the participants. On the other hand, a Mexican longitudinal study examined 1,300 participants who included adults in a research of 14 years and determined that greater sugar-sweetened beverages (SSBs) intake was significantly related to higher levels of hyperuricemia. The study also established that the participants consuming 7 or more servings of SSB were almost two times more likely to experience hyperuricemia than the participants consuming fewer than 1 serving of SSB per week. This association was still present after confounding factors were accounted and the soft drinks sweetened with diet did not have a similar association [21]. In another research, some of the most imminent risk factors found to lie behind hyperuricemia involved the frequent intake of fatty food, smoked, and fried foods, sugar liquids, alcohol, and decreased intake of milk and Soya products, and less sleep duration [22].

Overall, this research brings forward the fact that female gender is an important independent risk factor of hyperuricemia among the diabetic individuals as well as the implication of the protective effect of lean proteins and low-saturated fat diets. But other lifestyle and clinical factors that are usually presumed to have a bearing on uric acid levels failed to find statistical significance association in the present cohort. The results point to the relevance of gender-related screening and nutritional education approaches to the treatment of diabetics. This research was limited by the fact that it was a cross-sectional research and thus it was not possible to come up with a causal relationship. A certain biasness was possible due to the rather small sample size and the use of self-acquired data on the diet. In addition to this, the menopausal profile, serum insulin, or renal markers were not assessed, which might affect uric acid levels.

## CONCLUSION

The study concluded that there is a high likelihood of women with type II diabetes to develop hyperuricemia compared to men. Most clinical and lifestyle variables were not significantly associated but eating lean protein and food with low fat appeared to be helpful. These findings indicate the necessity of gender-sensitive treatment and easy-to-grasp dietary recommendations as the methods of monitoring uric acid levels.

## REFERENCES


1. Bhori M, Rastogi V, Tungare K, Marar T. A review on interplay between obesity, lipoprotein profile and nutrigenetics with selected candidate marker genes of type 2 diabetes mellitus. Mol Biol Rep. 2022;49(1):1-17
2. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Res Clin Pract. 2022;183:109119
3. Bashir AA, Bathija D, Chandrakar S. A study of prevalence of metabolic syndrome and hyperuricemia in type 2 diabetes mellitus. Int J Acad Med Pharm. 2024;6:1153-8
4. Li C-H, Lee C-L, Hsieh Y-C, Chen C-H, Wu M-J, Tsai S-F. Hyperuricemia and diabetes mellitus when occurred together have higher risks than alone on all-cause mortality and end-stage renal disease in patients with chronic kidney disease. BMC Nephrol. 2022;23(1):157
5. Arersa KK, Wondimnew T, Welde M, Husen TM. Prevalence and determinants of hyperuricemia in type 2 diabetes mellitus patients attending Jimma Medical Center, Southwestern Ethiopia, 2019. Diabetes Metab Syndr Obes. 2020;13:2059-67
6. Singh SK, Singh R, Singh SK, Iquebal MA, Jaiswal S, Rai PK. Uric acid and diabetes mellitus: an update. Postgrad Med J. 2023;99(1178):1220-5
7. Anwar A, Butt NI, Ashfaq F, Aftab S, Nasim H, Khan FA. Elevated CRP level in metabolic syndrome. RMJ. 2022;47(4):837-
8. Abdel KA, Kalluvya SE, Sadiq AM, Ashir A, Masikini PI. Prevalence of Hyperuricemia and Associated Factors Among Patients With Type 2 Diabetes Mellitus in Northwestern Tanzania: A Cross-Sectional Study. Clin Med Insights Endocrinol Diabetes. 2024;17:11795514241274694
9. Butt N, Ghoauri M, Hasnain M, Waris B. Hyperuricemia in Patients with Type 2 Diabetes Mellitus at a Tertiary Care Hospital in Bahawalpur Pakistan. SLJM. 2024;33(3)
10. Mumtaz A, Hadi Hasan A, Hassan R, Hassan M, Khan TM, Warrarich BI, et al. Association between serum uric acid level and microalbuminuria among type 2 diabetic patients: a cross-sectional study. IJCMPH. 2023;10(9):3103-6.https://doi.org/10.18203/2394-6040.ijcmph20232666
11. Gulzar A, Kamran MA, Muhammad A, Mumtaz B, Khan I, Tariq M. Frequency of hyperuricemia in type-2 diabetes mellites and its relation with diabetic nephropathy. PAFMJ. 2023;73(1):199
12. Abujbara M, Al Hourani HM, Al-Raoush RI, Khader YS, Ajlouni K. Prevalence of hyperuricemia and associated factors among type 2 diabetic patients in Jordan. Int J Gen Med. 2022;15:6611

13. Sun S, Chen L, Chen D, Li Y, Liu G, Ma L, et al. Prevalence and associated factors of hyperuricemia among Chinese patients with diabetes: a cross-sectional study. Ther Adv Endocrinol Metab. 2023;14:20420188231198620

14. Onchoke VB, Banturaki A, Onyanga N, Nganda P, Munyambalu DK, Lagoro CA, et al. Prevalence of hyperuricemia, associated factors and its effect on risk of coronary artery disease among out-patients with Diabetes Mellitus in Uganda. Res Sq. 2023.https://doi.org/10.21203/rs.3.rs-2613282/v1

15. Guertin C, Pelletier L, Pope P. The validation of the Healthy and Unhealthy Eating Behavior Scale (HUEBS): Examining the interplay between stages of change and motivation and their association with healthy and unhealthy eating behaviors and physical health. Appetite. 2020;144:104487

16. Donkeng M, Kuaté D, Koudjou PN, Noubiap JJ, Kuiate JR. Association between hyperuricemia and glycated hemoglobin in type 2 diabetes at the District Hospital of Dschang. Pan Afr Med J. 2021;40(1)

17. Wei Y, Wu Z, Wang Y, Wang G, Liu J. Interaction of sex and diabetes on the association between hemoglobin glycation index, hemoglobin A1c and serum uric acid. Diabetol Metab Syndr. 2022;14(1):185

18. He X, Shao W, Yu S, Yu J, Huang C, Ren H, et al. Healthy lifestyle scores associate with incidence of type 2 diabetes mediated by uric acid. Nutr Metabol. 2023;20(1):47

19. Zhu Q, Yu L, Li Y, Man Q, Jia S, Liu B, et al. Association between dietary approaches to stop hypertension (DASH) diet and hyperuricemia among Chinese adults: findings from a nationwide representative study. Nutr J. 2023;22(1):21

20. Fajardo VC, Barreto SM, Coelho CG, Diniz MdFH, Molina MdCB, Ribeiro ALP, et al. Adherence to the Dietary Approaches to Stop Hypertension (DASH) and Serum Urate Concentrations: A Longitudinal Analysis from the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). J Nutr. 2024;154(1):133-42

21. Meneses-León J, León-Maldonado L, Macías N, Torres-Ibarra L, Hernández-López R, Rivera-Paredez B, et al. Sugar-sweetened beverage consumption and risk of hyperuricemia: a longitudinal analysis of the Health Workers Cohort Study participants in Mexico. Am J Clin Nutr. 2020;112(3):652-60

22. Zhang W-Z, Peng Q, Cai X-S, Jiang G-L, Huang J-J, Lu L-L, et al. A study on the correlation between hyperuricemia and lifestyle and dietary habits. Medicine. 2025;104(5):e41399

# RISK FACTORS OF MATERNAL NEAR MISS AMONG FEMALES: A SYSTEMIC REVIEW

Kiran Saeed[1], Nimra Abid[1], Syeda Tahira Sherazi[2], Sadaf Fayyaz[3], Sariya Tul Tahira[1]
1. Registrar, Sir Ganga Ram Hospital, Lahore, Pakistan
2. Consultant gynecologist Pindi Bhattian, Pakistan
3. Senior Women Medical Officer, Sir Ganga Ram Hospital Lahore, Pakistan

**ARTICLE INFO**

**SYSTEMATIC REVIEW**

**Corresponding author:**
Dr. Kiran Saeed, Registrar, Sir Ganga Ram Hospital Lahore, Pakistan
**Email:**
dr.kiransaeed09@gmail.com
**Vol: 3 | Issue:2**
ISSN Print: 2960-2580
ISSN Online: 2960-2599

**Publisher:**
Medical Research and Statistical Consultancy Training Centre (SMC-PRIVATE) Limited

**Author's contributions**
**Kiran Saeed:** Idea, data collection, write up
**Nimra Abid:** Data collection, write up
**Syeda Tahira Sherazi:** literature search
**Sadaf Fayyaz:** proof read, discussion
**Sariya Tul Tahira:** Literature search
**Keywords:** Maternal near-miss, risk factors, obstetric complications, antenatal care, maternal health, WHO criteria

## ABSTRACT

**Background:** Maternal near-miss (MNM) is a critical indicator for evaluating maternal healthcare quality, reflecting cases where women survive life-threatening obstetric complications. This review aimed to identify the leading risk factors associated with MNM based on recent global observational studies. **Methods:** A systematic search was conducted across PubMed, Scopus, Web of Science, and Google Scholar for studies published between 2020 and 2024. Observational studies assessing maternal near-miss and its risk factors using WHO or similar criteria were included. A total of 30 studies were reviewed from diverse settings, including low-, middle-, and high-income countries. **Results:** Hypertensive disorders (n=25 studies), obstetric hemorrhage (n=21), lack of antenatal care (n=18), and socio-demographic disadvantages such as rural residence and poor education (n=15) emerged as the most frequent risk factors. Additional contributors included anemia (n=14), previous cesarean section (n=12), and delays in accessing care. Protective factors identified were timely antenatal visits, spontaneous labor, and quality hospital-based multidisciplinary care. **Conclusion:** MNM remains highly prevalent, especially in LMICs, with preventable factors playing a dominant role. Targeted public health interventions to improve antenatal care coverage, early risk identification, and emergency obstetric services are essential to reduce the burden of MNM and improve maternal outcomes.

## INTRODUCTION

A "maternal near-miss (MNM)" denotes to the circumstances when a woman nearly dies but survives, experiences the problem during pregnancy, during delivery or in 42 days after the end of the pregnancy [1].

The global incidence of MNM at 18.67, 3.10 per 1000 in Europe and 16.92 per 1000 in Asia [2]. There was a large risk of MNM events developing toward mother mortality. therefore, WHO method of monitoring MNM would be greatly helpful [3]. Pakistan, reported 186 maternal mortality ratio (MMR) for every 100,000 live births in 2019, a 32% increase in MMR of 140 deaths in 100,000 live births in 2017 [4]. MNM take place 20 times more than actual maternal death and affect maternal health in wide ways reaching up to severe Maternal Morbidity [5].

Maternal education, educational attainment, socioeconomic level, distance from healthcare facilities, time to get care, residential area, referrals from other health facilities, inadequate prenatal care (ANC) use, a history of complicated labor and past cesarean sections are among the many factors connected to MNM [6]. The socioeconomic factors continue to have a huge impact on women's approach to care facilities. Even in most countries with free medicine, there are remarkable differences in the use of medicines especially among mothers and their offspring's [7]. Women suffering from life threatening diseases also sometimes experience delays while moving towards advanced medical attention. The absence of medico-logistical infrastructure in under-developed countries is a big problem. Limited reference systems and quality of treatment facilities is an obstacle to access to care [8].

The data regarding MNM prevalence is quite inconsistent, such as, a study from Malaysia reported a prevalence of "**1.68%**" [9], while a study from Ethiopia documented a much higher rate of "**28.7%**" [10]. Similarly, the risk factors associated with MNM also differ significantly between studies. Prevention and treatment of MNM rely on a functional and accessible healthcare. Thus, the identification of variables during pregnancy and delivery may be critically important for preventing mother death. This systematic research tried to discover pre-determinant socio-economic, demographic and obstetric traits signifying MNM among women aged 15–49 in Pakistan.

## METHODS

### Search Strategy

The PubMed, Scopus, Web of Science, and Google Scholar databases were systematically searched for relevant studies published online from 2020 to 2024. The search strategy focused on 2 key words or phrases: ("maternal near miss" AND (risk factors or determinants). In addition to database searches, the **reference lists of selected articles** were manually screened to identify additional eligible studies. The full-text articles were read to confirm eligibility and to collect relevant information from the selected abstracts. Only articles written in English were included in this study. The reasons for exclusion criteria are listed in the PRISMA flowchart.

**Key risk factors identified included:**

Hypertensive Disorders, Maternal Infections, Socio-demographic Factors (Rural Residence, Lack of Education) Age: Younger women, particularly those under 20 years of age, and older women above 35 years had higher odds of MNM. Inadequate Antenatal Care: Women with inadequate or no antenatal care visits had a significantly higher risk of experiencing MNM, History of c-section, Anemia, Previous stillbirth and Delayed hospital arrival

**ELIGIBILITY CRITERIA**

**Inclusion criteria:**

- Studies that reported on maternal near miss based on WHO criteria or similar definitions.
- Studies identifying risk factors associated with MNM.
- Studies from both high- and low-income countries.

**Exclusion criteria:**

- Studies focusing only on neonatal/maternal deaths or unrelated maternal health conditions.
- Case reports, commentaries, and non-peer-reviewed articles.
- did not apply WHO maternal near miss definitions.

**Data Analysis:**

Based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) checklist, [11] this study was designed to review the body of the available literature on MNM published from 2020-2024. We have searched the electronic databases including PubMed, Scopus and Web of Science and manually checked references of the identified relevant papers. Data from the included studies were extracted and synthesized using a narrative approach due to the heterogeneity in study designs, populations, and outcome measurements. Key maternal risk factors for near-miss events were identified based on their frequency of occurrence across the 30 selected observational studies. Each study was reviewed for reported associations between specific clinical, obstetric, and socio-demographic variables and maternal near-miss cases, as defined by WHO or similar criteria. Recurring patterns were noted, and the most commonly reported risk factors were ranked according to how frequently they appeared across studies.

**RESULTS**

This systematic review included 30 observational studies published between 2020 and 2024, conducted across diverse settings including Ethiopia (10 studies), India (6), Pakistan (2), China, Bangladesh, Turkey, Malaysia, Ghana, Somalia, and multi-country analyses from LMICs. The prevalence of maternal near miss (MNM) varied significantly, ranging from 1.68 to 140 per 1,000 live births. Hemorrhage and hypertensive disorders emerged as the leading causes of MNM, identified in 25 and 24 studies, respectively. Severe anemia was reported as a contributing factor in 10 studies, while sepsis and infections were mentioned in

8 studies. Uterine rupture and unsafe abortion were less commonly noted but still significant in 4 and 3 studies, respectively. Socio-demographic risk factors were frequently reported: rural residence was associated with increased MNM in 14 studies, and low maternal education in 12 studies. Maternal age extremes, particularly age below 20 or above 35—were linked to MNM in 10 studies. Obstetric history, such as prior cesarean section, was identified as a risk factor in 9 studies, while a history of stillbirth was reported in 5. Anemia was found to be a major contributor in 10 studies. Notably, inadequate or absent antenatal care (ANC) was a consistent predictor, reported in 20 studies. Health system-related delays, especially delay in reaching or receiving care, were highlighted in 15 studies.

On the other hand, protective factors such as regular ANC attendance were mentioned in 18 studies. Use of the partograph during labor was considered beneficial in 4 studies, while access to emergency obstetric care, timely referral, and multidisciplinary care were emphasized in at least 10 studies. Some studies from low-resource settings also highlighted spontaneous labor, maternal education, and proximity to care facilities as protective against severe maternal complications. The cumulative evidence strongly indicates that both clinical and systemic determinants play a critical role in the occurrence and prevention of maternal near-miss events globally.

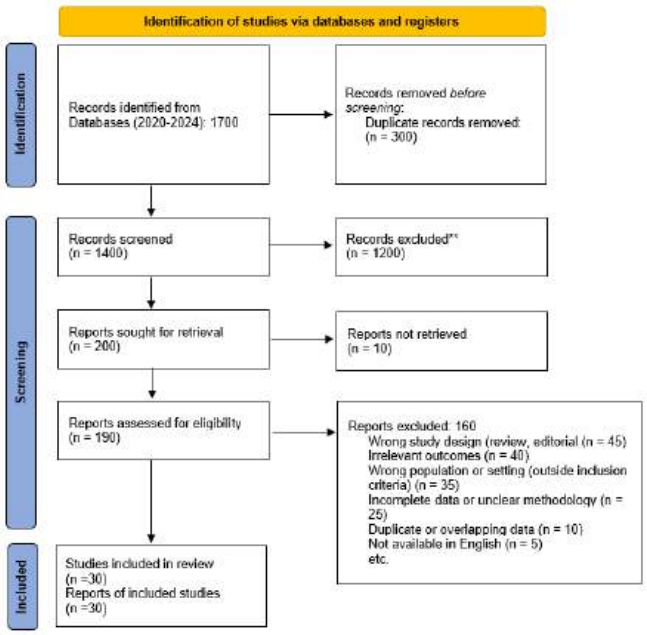



**Fig-1:** Flow diagram showing the procedures of selecting studies for systemic review of the Maternal Near-Miss Risk Factors Across 30 Studies (2020–2024)

**Table-1: Summary of Maternal Near-Miss Risk Factors Across 30 Studies (2020–2024)**

| No. | Study Location | Prevalence of MNM | Leading Causes | Significant Risk Factors | Protective Factors |
|---|---|---|---|---|---|
| 1 | Hunan, China [12] | 3.37 per 1000 live births | Hematological dysfunction | Advanced age, nulliparity, <5 ANC visits, C-section history | Antenatal care |
| 2 | LMICs (Bauserman et al.) [13] | N/A | Hemorrhage, hypertensive disorders | High parity, age >35, no education | Spontaneous labor |
| 3 | Ghana [14] | 34.2 per 1000 live births | Hypertensive disorders, Hemorrhage | Fever, delay, referred care | Spontaneous labor |
| 4 | Africa (Meta-analysis) [15] | 73.64 per 1000 live births | PPH, Hypertensive disorders | Rural residence, low income, ANC absence | ANC attendance |
| 5 | Sub-Saharan Africa [8] | N/A | Severe maternal complications | Low SES, rural residence, referral delays | Education, ANC |
| 6 | Ethiopia (Hawassa) [16] | 16.1% | Hypertensive disorders | Rural, referral, stillbirth, delay | Facility readiness |
| 7 | Ethiopia (Meta-analysis) [17] | 54.33 per 1000 live births | Hemorrhage, Hypertensive disorders, Infections | Poor ANC, previous C-section | ANC visits |
| 8 | Ethiopia (Bale Zone) [10] | 28.7% | Hemorrhage, Infection | Early marriage, low husband's education | Community awareness |
| 9 | Ethiopia (National Review) [6] | 12.57% | N/A | Rural, unmarried, uneducated | ANC attendance |
| 10 | Ethiopia (2023 Meta-analysis) [18] | 140 per 1000 live births | Hemorrhage, Hypertensive disorders, Anemia | No ANC, anemia, chronic disease, C-section | ANC, early intervention |
| 11 | West Shoa, Ethiopia [19] | N/A | N/A | No ANC, >60 min distance, illiteracy | ANC, proximity to care |
| 12 | North Shewa, Ethiopia [20] | 14.3% | Preeclampsia, PPH | Non-use of partograph, abortion history | Early monitoring |
| 13 | Nekemte, Ethiopia [21] | 4.97% | Hypertensive disorders, PPH | Multigravidity, delay, labor induction | Timely delivery care |
| 14 | Gondar, Ethiopia [22] | 15.8% | Bleeding, PIH | Low income, long hospital stay | - |
| 15 | Pakistan [23] | N/A | Hemorrhage, Hypertensive disorders | Rural, unbooked, multiparity | Facility access |
| 16 | 26 MICs (Systematic Review) [24] | Median 15.9 per 1000 live births | Hemorrhage (LMIC), Hypertensive disorders (UMIC) | Regional criteria disparities | - |

| | | | | | |
|---|---|---|---|---|---|
| 17 | Somalia [25] | N/A | Anemia, Preeclampsia | Rural, young age, no ANC | ANC, education |
| 18 | Malaysia [9] | 1.68% | Hemorrhage | C-section history | Young age |
| 19 | Malawi [26] | N/A | Hypertensive disorders, Uterine rupture | Age 31–35, emergency C-section | - |
| 20 | Ethiopia [27] | N/A | Severe Preeclampsia, PPH | Delivery at referral, education level of husbands, ANC visit, c-section | Young age |
| 21 | New Delhi, India [28] | 3.25 per 1000 live births | Hemorrhage, Hypertensive disorders | High maternal mortality index (71.95%), requiring ICU/HDU care | Need for simplified MNM identification tools for frontline workers in low-resource settings |
| 22 | Turkey [29] | 2.04 per 1000 live births | Hypertensive disorders (gestational hypertension, preeclampsia, HELLP), Hemorrhage, Cardiovascular disease, Diabetes | Hypertensive disorders (42% gestational hypertension, 40% preeclampsia), Cardiovascular disease (18%), Diabetes (14%) | Timely management, early identification, multidisciplinary care |
| 23 | Bangladesh [30] | 6.8 per 1000 live births | Hypertensive disorders (52.3%), Obstetric hemorrhage (31.8%), Cardiopulmonary dysfunction (15.9%) | Hypertensive disorders, Obstetric hemorrhage | C-section delivery, MNM surveillance, maternal mortality reviews, evidence-based care |
| 24 | Bhopal, India [31] | 10.16 per 1000 live births | Hemorrhage (47.61%), Hypertensive disorders (28.57%) | Majority aged 18-25 years, rural backgrounds, adverse perinatal outcomes (preterm birth, stillbirth) | Need for improved maternal health services in rural areas to reduce maternal mortality |
| 25 | Meerut, India [32] | 12 per 1000 live births | Hemorrhage, Hypertensive disorders, Sepsis, Severe anemia | High severe maternal outcome rate, need to strengthen peripheral referral centers, obstetric HDUs | Timely blood availability, training of multidisciplinary teams |

| | | | | | |
|---|---|---|---|---|---|
| 26 | India [33] | 18.76 per 1000 live births | Hypertensive disorders, Obstetric hemorrhage, Anemia | Late trimester presentation, multiparity, low education, poor awareness | Maternal education, early risk identification, quality critical care |
| 27 | India [34] | N/A | Hypertensive disorders (42.2%), Obstetric hemorrhage (30.79%), Severe anemia (11.42%), Sepsis (9.52%) | Sepsis had the highest mortality index (14.28%) | Early detection and management of hypertensive disorders, hemorrhage, anemia, and sepsis |
| 28 | West Bengal, India [35] | N/A | Obstetric hemorrhage (47.5%), Eclampsia/Preeclampsia (29.5%) | Anemic teenagers, multigravidas, rural, low-education backgrounds, poor antenatal care | Early screening, timely referral to reduce preventable maternal complications |
| 29 | Arsi Zone, Ethiopia [36] | 34.4% prevalence rate | Hypertensive disorders (35%), Obstetric hemorrhage (35%), Ruptured uterus (11%), Unsafe abortion (8%), Obstructed labor (7%), Sepsis (4.5%) | Lack of ANC visits, delayed care-seeking, delayed reaching facilities | Improved ANC coverage, enhanced emergency obstetric services, timely care-seeking |
| 30 | Lahore, Pakistan [37] | 28.4 per 1000 live births | Hemorrhage (49.2%), Hypertensive disorders (33.4%), Cardiac disease (8.3%), Infection (4%) | Unbooked patients, higher mortality, delays in care | Timely care, addressing first and second delays, massive blood transfusion, hysterectomy, ICU admission |

## DISCUSSION

This systematic review points out which aspects are most closely linked to a maternal near miss (MNM). Using the WHO near-miss approach, a latest study from china found that MNM made up just 3.37% of cases. The factors were a mother aged 30 or more, not married, multiple pregnancies, never had a child, high parity (≥3), fewer than five visits to the doctor during pregnancy, and a prior cesarean delivery [12]. Similarly, Bauserman et al. (2020) observed that increased rates of mothers dying were mostly related to risks such as being over 35, not being educated, having no children or too many, and challenges during labor, severe bleeding before delivery, and high blood pressure during pregnancy [13]. In contrast, research from 3 tertiary

hospitals in southern Ghana showed that the prevalence of MNMs was 34.2 every 1,000 births. Of all cases, MNM was most often caused by hypertensive diseases (41%), followed by hemorrhage (12.2%), sepsis (11.1%), and uterine rupture (4.2%) [14]. Another study from Africa revealed that MNM causes were heavy post-childbirth bleeding and difficulties with high blood pressure. People living in rural areas, lacking money or education, who received poor prenatal care, lived far from medical centers, obtained treatment late, had a previous cesarean birth, and had pre-existing illnesses were discovered to be at high risk [15].

In sub-Saharan Africa, a systematic review highlighted certain obstetric, demographic, and economic aspects of fatal motherhood problems; MNM and this problem was significantly linked with economic status, type of education, mother's age, rural location, delays in seeking help, and healthcare inequality [8]. In the same manner, another study from Ethiopia found that MNM cases account for 16.1% of births at that hospital. Half of the cases were hypertensive. Living in a rural area (AOR: 4.2), having referred from another institution (AOR 5.5), history of a stillborn fetus (AOR 10.2), and delayed admission to the hospital (AOR 4.8) were linked to MNM [16].

Another analysis included 43 studies from Ethiopia with a total of 77,240 MNM cases, calculating a pooled prevalence of 54.33 per 1,000 live births. Obstetric blood loss accounted for 14.56 cases out of 1000, hypertension caused 12.67, and 3.55 of every 1000 resulted from infections during pregnancy [17]. Similarly, from October 2018 to February 2019: a study in the Bale zone of Southeast Ethiopia with 300 women found that 28.7% had experienced MNM. Factors in these cases included being young, getting married young, having minimal education among partners, and living in a rural area [10]. Additionally, another meta-analysis in Ethiopia calculated using 98,268 women from eleven studies that the pooled prevalence of MNM was "12.57%". The 67% (OR=0.33) odds of maternal near misses was greatly mitigated by attending antenatal care. Conversely, factors associated with higher odds of a MNM included rural area of residence (OR=2.7), lack of formal schooling (OR=2.48), and being unmarried (OR=1.69) [6].

Also, a recent review from Ethiopia revealed pooled prevalence of MNM of 140 per 1,000 live births (95% CI: 80, 190) as of March 2023. Such factors like lacking formal education (AOR=2.10), lack of prenatal care (AOR=2.18), previous Caesarean section (AOR=4.07), Anemia (AOR=4.86), and the presence of chronic medical conditions (AOR=2.41) shaped defined MNM in Ethiopia [18]. Danusa's comprehensive unmatched case-control study in Ethiopia's found notable correlations between MNM and variables including advanced mother age, insufficient education, lack of prenatal care, a prolonged delay in seeking care (first delay exceeding 6 hours), and residence more than 60 minutes from a healthcare facility. For those who received no prenatal care (AOR = 2.25) and for those who had significant delays in seeking or receiving care (AOR = 4.02 for distances over 60 minutes), the likelihood also rose [19].

Another case-control study of Ethiopia's North Shewa Zone revealed that the main causes of MNM were pre-eclampsia (49.5%) and postpartum hemorrhage (28.3%). Key predictors included mother education (AOR = 4.80; 95% CI: 1.78–12.90), partner's education (AOR = 5.26; 95% CI: 1.46–18.90), referred from another facility (AOR = 4.73; 95% CI: 1.78–12.55), antenatal care visits (AOR = 2.75; 95% CI: 1.13–6.72), c-section (AOR = 3.70; 95% CI: 1.42–9.60), and medical disorders during pregnancy (AOR = 12.06; 95% CI: 2.82–51.55). A younger mother's age correlated with a protective effect (AOR = 0.26; 95% CI: 0.09–0.75) [27].

Another cross-sectional study in Central Ethiopia found MNM prevalence to be "14.3%" (95% CI: 11.9–16.6). Severe preeclampsia (31%), and postpartum hemorrhage (26%), were the two major complications. Birth at referral (AOR = 4.85) or general hospitals (AOR = 3.76), absence of partograph use during labor (AOR = 1.89), prior abortion history (AOR = 2.52), and other pregnancy related issues (AOR = 6.91) were the notables risk factors [20]. Likewise another study found a MNM rate of 4.97%. The main causes were hypertensive disease (40.9%), and obstetric blood loss (39.3%). Important factors were multigravidity (AOR = 3.84), absence of prenatal care (AOR = 6.02), delays in entering the institution (AOR = 12.00), and labor induction (AOR = 9.40) [21].

Using WHO MNM criteria, another cross-sectional study found a "15.8%" MNM percentage (95% CI: 11.9–20.1%). Income per month of ≤1000 ETB (AOR = 3.99; 95% CI: 1.65–9.65), a hospitalization of ≥7 days (AOR = 5.43; 95% CI: 2.49–11.6, vaginal bleeding (AOR = 2.75; 95% CI: 1.17–6.7, PIH (AOR = 5.13; 95% CI: 2.08–12.6) [22]. Similarly, the main causes of MNM events were bleeding (44.2%) and hypertension disorders (35.1%), according to cross-sectional research done at Liaquat University Hospital in Hyderabad/Jamshoro, Pakistan. Most of the cases involved non-scheduled, villagers, multipurous females between the ages of 26 and 30, who most needed acute care [23].

Using the WHO criteria, a thorough analysis of data from 69 studies reported that in lower-middle-income countries the MNM ratio for every 1,000 live births was "15.9" (IQR: 8.9–34.7); in upper-middle-income countries it was "7.8" (IQR: 5.0–9.6). In lower-middle-income countries, obstetric hemorrhage dominated the cause; in upper-middle-income countries, hypertension problems were more common [24]. Recent studies conducted in Mogadishu, Somalia, identified pre-eclampsia, severe Hb deficiency, and antepartum blood loss as important factors. Living in rural area (OR = 2.685), short intervals in birth (OR = 5.922) and postponements in seeking medical attention (OR = 1.773), lower age of mother (OR = 2.728), absence of formal education (OR = 2.829), and non-participation in prenatal care (OR = 2.686) were the main significant risk factors for mother and newborn mortality [25].

Severe mother morbidity (SMM) was also found in Malaysia to be 2.45% (95% CI: 2.03, 2.89) and MNM to be 1.68% (95% CI: 1.42, 1.95). Significant risk factors for SMM were a prior c-section (OR = 1.63, 95% CI: 1.43, 1.87), less maternal age (OR = 0.71, 95% CI: 0.60, 0.83), concurrent medical problems (OR = 1.51, 95% CI: 1.28, 1.78), and preterm birth (OR = 0.14, 95% CI: 0.08, 0.23). In MNM, earlier c-section was found to be independent risk factor (OR = 2.68, 95% CI: 1.41, 5.10) [9].

A case-control study carried out in Malawi showed that female of 31–35 years old showed increased incidence of MNM (OR = 3.14; 95% CI: 1.09–9.09) but emergency cesarean delivery (OR = "4.08"; 95% CI: 2.34–7.09) and laparoscopic surgery in case of uterine rupture (OR = "83.49"; 95% CI: 10.49–664.55) were considerably predictive of MNM [26]. Investigating the clinical profile and incidence of MNM cases at a tertiary care hospital in New Delhi reveals a MNM ratio of "3.25" for every one thousand live births and a notable death rate of 71.95%. The main causes were hemorrhage and hypertension disorders of pregnancy [28]. Using WHO criteria, Tonyali et al. conducted a retroactive study in Turkey. With hypertension disorders—comprising gestational hypertension ("42%"), pre-eclampsia ("40%"), and HELLP syndrome ("14%"), followed by hemorrhagic complications and medical conditions including heart related conditions (18%), and diabetes mellitus(14%), most MNM events occurred antenatally (46%), or intrapartally (34%) [29].

Another observational study was conducted in Bangladesh, sought to With 44 MNM and 13 mother deaths (MD), among 8976 admissions, the MNM ratio was 6.8 for every one thousand live births and the MNM to MD ratio was 3.4:1. Hypertensive diseases (52.3%), obstetric hemorrhage (31.8%), and cardiopulmonary dysfunction (15.9%), were the main causes of MNM. With a few needing laparotomy or peripartum hysterectomy, cesarean section (73%) was used to treat most MNM patients [30]. Another study in Bhopal stated that an MNM ratio of 10.16 for every one thousand live births and a mother death to MNM ratio of 1:2.17 the statistics show a significant burden of severe mother morbidity. Affected women most typically came from rural backgrounds (55.5%) and fell between the ages of 18 and 25 (58.73%). Hemorrhage (47.61%), and hypertension disorders (28.57%) were observed to be main factors behind MNM [31].

Over one year, a retrospective study conducted in Meerut, Uttar Pradesh, sought to evaluate MNM events and compare them with mother mortality. Of 4,360 deliveries and 4,333 live births, 79 women experienced life-threatening complications—52 classified as MNM. Hemorrhage and hypertension were considered as main culprit; followed by sepsis and severe anemia [32]. In addition, in India a retrospective study reported that there were 164 events of MNM and 24 mother deaths, so producing an MNM incidence ratio of 18.76 per 1,000 live births, an MNM to mortality ratio of 6.8:1, and a death index of 12.7% [33].

Another retrospective observational study documented that of 36,366 births, 315 cases of MNM were found; the main cause was hypertension (42.2%), followed by obstetric hemorrhage (30.79%), severe anemia

(11.42%), and sepsis (9.52%). With a death rate of 14.28%, septic had the strongest correlation with lethal consequences [34]. Whereas in West Bengal using another study stated that together with a 2.1% prevalence of ICU admissions in gynecological cases patients, the MMR was "2.25". While eclampsia and pre-eclampsia (29.5%) and hemorrhage (20.5%) were the main causes of death, obstetric hemorrhage (47.5%) was the main cause of MNM [35]. Determined to be 34.4% [95% CI: 29.2–39.8], the rate of MNM in Ethiopia's public hospitals in the Arsi Zone indicates a noteworthy load of severe maternal issues. Hypertensive diseases (35%), obstetric hemorrhage ("35%"), ruptured uterus ("11%"), unsafe abortion ("8%"), obstructed labor ("7%"), and sepsis ("4.5%") followed in order of main direct causes [36]. Examining local prospective cross-sectional data at Services Hospital, Lahore (2016–2018) revealed 29 mother deaths among 10,739 live births and 305 MNM events. With a near-miss ratio of 1:10.5 and an MNM frequency of 28.4 for every one thousand live births, the mother mortality was rather low. The main causes were hemorrhage (49.2%) and hypertension disorders (33.4%), then heart disease (8.3%) and infection (4%). Most patients—62.5%—were unscheduled and showed a rather high death rate ($p<0.001$) [37].

The findings of this assessment complement earlier researches performed in other low- and middle-income countries, where bleeding and hypertension diseases dominated causes of mother morbidity. This study offers new perspectives on the important impact of socio-demographic factors, predominantly in rural zones with inadequate approach to care facilities. LMIC healthcare systems have to be equipped to handle obstetric crises, and women should be driven to get quick medical attention.

## CONCLUSION

Maternal near miss is a major public health concern that disproportionately impacts women in low- and middle-income countries. Key risk factors include hypertensive disorders, obstetric hemorrhage, and maternal infections, with socio-demographic factors like rural residence and low education levels exacerbating the risk. Strengthening maternal healthcare, improving antenatal care access, and addressing socio-economic disparities are vital steps to reduce maternal morbidity and improve outcomes globally.

## REFERENCES

1. Omona K, Babirye D. Maternal near misses (MNM) and their determinants among women who sought obstetric care from fort portal regional referral hospital, Western Uganda. Cogent Public Health. 2023;10(1):2157996.

2. Abdollahpour S, Miri HH, Khadivzadeh T. The global prevalence of maternal near miss: a systematic review and meta-analysis. Health Promot Perspect. 2019;9(4):255.

3. England N, Madill J, Metcalfe A, Magee L, Cooper S, Salmon C, et al. Monitoring maternal near miss/severe maternal morbidity: a systematic review of global practices. PloS One. 2020;15(5):e0233697.

4. Shaeen SK, Tharwani ZH, Bilal W, Islam Z, Essar MY. Maternal mortality in Pakistan: challenges, efforts, and recommendations. Ann Med Surg. 2022;81.

5. Samuels E, Ocheke AN. Near miss and maternal mortality at the Jos University teaching hospital. Nigerian Med J. 2020;61(1):6-10.

6. Mengist B, Desta M, Tura AK, Habtewold TD, Abajobir A. Maternal near miss in Ethiopia: protective role of antenatal care and disparity in socioeconomic inequities: a systematic review and meta-analysis. IJANS. 2021;15:100332.

7. Barasa E, Kazungu J, Nguhiu P, Ravishankar N. Examining the level and inequality in health insurance coverage in 36 sub-Saharan African countries. BMJ Glob Health. 2021;6(4):e004712.

8. Diakite M, de Brouwere V, Assarag B, Belrhiti Z, Zbiri S, Khalis M. Socioeconomic, demographic and obstetric determinants of maternal near miss in Africa: A systematic review. PloS One. 2025;20(2):e0313897.

9. Nik Hazlina NH, Norhayati MN, Shaiful Bahari I, Mohamed Kamil HR. The prevalence and risk factors for severe maternal morbidities: a systematic review and meta-analysis. Front Med. 2022;9:861028.

10. Mekonnen A, Fikadu G, Seyoum K, Ganfure G, Degno S, Lencha B. Factors associated with maternal near-miss at public hospitals of South-East Ethiopia: An institutional-based cross-sectional study. Womens Health (Lond). 2021;17(19):17455065211060617.

11. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ. 2009;339.

12. Zhou X, Fang J, Wu Y, Gao J, Chen X, Wang A, et al. Risk factors for maternal near-miss in an undeveloped province in south-central China, 2012–2022. BMC Public Health. 2024;24(1):1526.

13. Bauserman M, Thorsten VR, Nolen TL, Patterson J, Lokangaka A, Tshefu A, et al. Maternal mortality in six low and lower-middle income countries from 2010 to 2018: risk factors and trends. Reprod Health. 2020;17:1-10.

14. Oppong SA, Bakari A, Bell A, Bockarie Y, Adu J, Turpin C, et al. Incidence, causes, and correlates of maternal near-miss morbidity: a multicentre cross-sectional study. Obstet Anesth Dig. 2020;40(1):14-5.

15. Habte A, Bizuayehu HM, Lemma L, Sisay Y. Road to maternal death: the pooled estimate of maternal near-miss, its primary causes and determinants in Africa: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2024;24(1):144.

16. Tolesa D, Abera N, Worku M, Wassihun B. Prevalence and associated factors with maternal near-miss among pregnant women at Hawassa University comprehensive specialized hospital, Sidama Region, Ethiopia. Int J Womens Heal Wellness. 2021;7:1353-2474.

17. Tesfay N, Hailu G, Begna D, Habtetsion M, Taye F, Woldeyohannes F, et al. Prevalence, underlying causes, and determinants of maternal near miss in Ethiopia: a systematic review and meta-analysis. Front Med. 2024;11:1393118.

18. Negash A, Sertsu A, Mengistu DA, Tamire A, Birhanu Weldesenbet A, Dechasa M, et al. Prevalence and determinants of maternal near miss in Ethiopia: a systematic review and meta-analysis, 2015–2023. BMC Women Health. 2023;23(1):380.

19. Danusa KT, Debelo BT, Wakgari N, Seifu B, Kenasa K, Daba G, et al. Predictors of maternal Near Miss in Public hospitals of West Shoa Zone, Central Ethiopia: a case-control study. Front Med. 2022;9:868992.

20. Gebremariam TB, Demie TG, Derseh BT, Mruts KB. Trends of and Factors Associated with Maternal Near-Miss in Selected Hospitals in North Shewa Zone, Central Ethiopia. J Pregnancy. 2022;2022(1):2023652.

21. Kumela L, Tilahun T, Kifle D. Determinants of maternal near miss in Western Ethiopia. Ethiop J Health Sci. 2020;30(2).

22. Asaye MM. Proportion of Maternal Near-Miss and Its Determinants among Northwest Ethiopian Women: A Cross-Sectional Study. Int J Reprod Med. 2020;2020(1):5257431.

23. Murtaza H, Panhyar S, Memon E, Uroosa B, Liaquat F, Hussain M. Evaluation of Maternal Near Miss (MNM) Events and Maternal Mortality at Tertiary Care Hospital: Maternal Near Miss (MNM) Events and Maternal Mortality. Pak J Health Sci. 2024;5(11):155-9.

24. Heitkamp A, Meulenbroek A, van Roosmalen J, Gebhardt S, Vollmer L, de Vries JI, et al. Maternal mortality: near-miss events in middle-income countries, a systematic review. Bull World Health Organ. 2021;99(10):693.

25. Dahie HA. Determinants of maternal near miss events among women admitted to tertiary hospitals in Mogadishu, Somalia: a facility-based case–control study. BMC Preg Childbirth. 2022;22(1):658.

26. Kachale F, Malata AM, Chorwe-Sungani G, Maluwa A, Chirwa E. Determinants of maternal near-miss cases at two selected central hospitals in Malawi. Malawi Med J. 2021;33(Postgraduate Supplementary Iss):3.

27. Teshome HN, Ayele ET, Hailemeskel S, Yimer O, Mulu GB, Tadese M. Determinants of maternal near-miss among women admitted to public hospitals in North Shewa Zone, Ethiopia: A case-control study. Front Public Health. 2022;10:996885.

28. Chonla A, Gupta S. Maternal near miss in a tertiary care hospital: A retrospective and prospective observational study. IJOGR. 2023;10(3):289-93.

29. Tonyali NV, Aktemur G, Karabay G, Cakir BT, Dayanir H, Akkus IB, et al. Maternal near miss: A comprehensive analysis of severe maternal morbidity and mortality at a tertiary referral center. Ann Med Res. 2024;31(11):935–40.

30. Surovi FA, Noor S, Ali SI, Sultana A. Maternal Near Miss in A Tertiary Care Hospital: An Observational Study. CMOSHMC J. 2022;21(1):57-60.

31. Thakur A, Toppo M, Lodha R. A Study on Maternal Near Miss: The Submerged Iceberg, in a Tertiary Care Hospital of Central India. Indian J Public Health Res Dev. 2023;14(3):17.

32. Verma A, Choudhary R, Chaudhary R, Kashyap M, Choudhary Sr R. Maternal Near-Miss and Maternal Mortality in a Tertiary Care Center of Western Uttar Pradesh: A Retrospective Study. Cureus. 2023;15(7).

33. N S, R S, M I. Analysis of maternal near miss cases in a tertiary care hospital. IJRCOG. 2023;12:1248-52.

34. Ingole SJ, Chaudhary SN. Maternal Near Miss Events in Tertiary Care Hospital: A Retrospective Observational Study. JCDR. 2021;15(4).

35. Begg NP, Dasgupta S, Chowdhury S. An audit of maternal near-miss and mortality cases in a tertiary care rural teaching hospital in Eastern India: A 2-year retrospective analytical case–control study. Asian J Med Sci. 2022;13(10):146-51.

36. Regassa WM, Gemeda GM, Wakwoya EB, Gelete BW. Magnitude of maternal near-misses and associated factors in Arsi Zone public hospitals in Oromia, Ethiopia, 2022. Heliyon. 2024;10(2).

37. Wasim T, Raana GE, Wasim M, Mushtaq J, Amin Z, Asghar S. Maternal near-miss, mortality and their correlates at a tertiary care hospital. JPMA. 2021;71(7):1843-8.