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PREVALENCE AND ASSOCIATED RISK FACTOR OF POSTPARTUM HEMORRHAGE IN TERTIARY CARE HOSPITAL OF PAKISTAN. A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Postpartum hemorrhage (PPH) continues to be a significant contributor to maternal illness and death, particularly in resource constrained regions. This research aimed to determine the occurrence and contributing factors of PPH among women who recently gave birth in tertiary level hospitals across Pakistan.

Methods: A descriptive, cross-sectional study was conducted at two major healthcare centers Lahore General Hospital, Ameer Ud Din Medical College, Lahore and Gulab Devi Hospital, Al Aleem Medical College, Lahore in Obstetrics and Gynaecology Department. Using a systematic random sampling approach, data were collected from 135 postpartum patients who had complete clinical documentation. Information retrieved retrospectively included sociodemographic, obstetric background, medical history, and laboratory indicators such as hemoglobin concentration, inflammatory markers, and clotting profiles. Data were analyzed using SPSS v26, with chi-square tests and logistic regression employed to isolate predictors of PPH. A p-value of less than 0.05 was deemed statistically significant.

Results: The overall occurrence of PPH was observed in 9.6% of the sampled cases. Among women with no fetal loss, those aged 36 years or above, with previous multiple pregnancies, labor exceeding 17 hours, low hemoglobin levels (under 10.5 g/dL), and raised Creative protein (CRP >12 mg/L) showed a higher likelihood of developing PPH. Notably, women experiencing extended labor had 2.8 times greater odds of encountering PPH (OR = 2.8; 95% CI: 1.6–5.2; p = 0.001).

Conclusion: The study underscores that PPH stems from a blend of clinical and demographic determinants. Focus antenatal assessment timely anemia management surveillance of labor duration and inflammatory screening could serve as critical strategies to mitigate the incidence of PPH and enhance maternal health outcomes.

Key words: Postpartum Hemorrhage, Prevalence, Anemia, C-Reactive Protein (CRP), Inflammatory Markers, Antenatal Assessment, Tertiary Care Hospitals, Maternal Morbidity

Introduction:

Postpartum hemorrhage defines as excessive bleeding following childbirth remain as leading cause of maternal mortality and morbidity worldwide. Despite numerous advancements in obstetric care, the condition continues to pose a major public health challenges partially in resource constrained environments such a low and middle inconnu countries. PPH is not only a clinical emergency but also an indicator of overall quality of maternal health service within a healthcare system. Globally it accounts for significant proportion of maternal death and in many developing nations, it is still among the top three proportion of maternal deaths and in many developing nations.[4] In the context of Pakistan, a country grappling with socioeconomic disparities infrastructure limitations and overburdened healthcare system the burden of maternal health complications is especially concerning.[5] Challenges such as delayed referral system limited access to skilled birth attendants, inadequate emergency obstetric service and lower awareness about maternal health further cornubite to high incidence of PPH. These factors collectively highlight the urgent need for more rebuts and context specific research focused on maternal complications in Pakistan healthcare settings.[6]

PPH is generally categorized as primary occurring within 24 hours of delivery or secondary accruing after 24 hours but withing six week postpartum.[7] clinically it is characterized by blood loss exceeding 450ml after virginal delivery on more than 950ml following cesarean section. however, due to subjective visual estimation and delays in measurements the true extent of blood complications inducing hypovolemic shock, organ failure and even death.[8]

Multiple risk factors have been implicated in the development of PPH. These include, but are not limited to, advanced maternal age (typically defined as 35 years and older), high parity (multiple previous births), prolonged duration of labor, history of obstetric complications, retained placenta, uterine atony, and preexisting anemia.[9] Among these, antepartum anemia is particularly relevant in Pakistan, where malnutrition and iron deficiency are widespread among women of reproductive age. Poor antenatal care and limited screening further exacerbate these risk factors.[10]

Despite the recognition of these determinants, there remains a dearth of localized data that accurately reflects the prevalence and risk patterns of PPH in tertiary care settings across Pakistan.[11] Tertiary hospitals, often acting as referral centers for complicated and high-risk pregnancies, play a critical role in managing obstetric emergencies. However, these institutions are often overwhelmed, understaffed, and lack uniform clinical protocols for timely identification and management of postpartum complications.[12] This reality underscores the necessity for studies that explore the specific dynamics of PPH within such hospital environments.

The rationales for the current study stems from treg need to generate empirical evidence on PPH withing high volume referral hospitals, where the most severe cases are often amanges.[13] by evaluating both the prevalence and associated risk factors of PPH in these sheeting this research seeks to full critical knowledge gap.[14] The study employees a across sectional approach to systematically examine demographic profiles, obstruct histories, and clinical and laboratory findings of postpartum woman. Special attention is given to the role of biomarkers such as hemoglobin concentration and inflammation markers es creative protein to explore the potential predict values for PPH.

The boarder goal of this investigation is not only to identify the frequency of PPH in tertiary hospital but also to offer actionable insight that could contribute to improved clinical practical and maternal health outcomes. By highlighting modified risk factors and suggesting focused interventions such as enhanced antenatal screening. Standardized labor monitoring protocols and timely corrections of anemia this study aspires to support policy development in strengthen maternal health service across country.[15]

Ultimately, the findings from this study are expected to serve as a foundational reference for future research, policy planning, and clinical guideline formulation in maternal healthcare. Addressing the complexities of PPH through targeted research is a vital step toward achieving safer pregnancies and reducing maternal mortality rates in Pakistan.

MATERIALS AND METHODS

Study Design and Setting

A descriptive, cross-sectional study was conducted over a 14month period, spanning from December 2021 to January 2023, at two prominent tertiary care hospitals in Pakistan Lahore General Hospital, Ameer Ud Din Medical College, Lahore and Gulab Devi Hospital, Al Aleem Medical College, Lahore in Obstetrics and Gynaecology Department. These institutions function as regional referral centers, catering to a large catchment population and managing a significant number of obstetric emergencies. Equipped with specialized maternal health units, they provide high-level obstetric and neonatal services. The primary aim of this research was to ascertain the prevalence of postpartum hemorrhage (PPH) and to identify its associated demographic, clinical, and biochemical risk factors among women who gave birth at these facilities during the study period.

Study Population and Sampling

The target population included all postnatal women who delivered at the aforementioned hospitals during the study period. Employing a systematic random sampling approach, the researchers ensured that the sample was representative of the broader population. Based on the sampling interval and eligibility criteria, a total of 135 participants were selected.

Inclusion criteria comprised women who:

- Delivered either vaginally or via cesarean section at one of the study hospitals.
- Had complete medical records, including detailed obstetric history and pertinent laboratory investigations.

Exclusion criteria were:

- Women referred from other healthcare centers after delivery.
- Cases with missing or incomplete medical documentation.

Data Collection and Demographic Information

A retrospective data collection methodology was employed. Patient data were extracted using a predesigned structured data abstraction form. Key demographic variables such as age, place of residence, educational attainment, occupation, and socioeconomic status were retrieved. In addition, obstetric profiles including gravidity, parity, type of delivery, history of PPH, and duration of labor were documented. Relevant clinical parameters like predelivery hemoglobin concentration, blood pressure, and the presence of comorbidities (e.g., hypertension, diabetes) were also recorded.

Biomarker Assessment

To explore possible biochemical predictors of PPH, the study included an evaluation of biomarkers routinely measured in antenatal and peripartum periods. These included:

- Hemoglobin and hematocrit levels, recorded in the third trimester or at the time of admission.
- Coagulation profiles such as Prothrombin Time (PT) and Activated Partial Thromboplastin Time (aPTT) to assess blood clotting functionality.
- When available, inflammatory markers like C-Reactive Protein (CRP) were included to evaluate systemic inflammation, which could potentially impact maternal outcomes.

Both hospitals adhered to uniform protocols for blood sample collection, handling, and analysis, ensuring consistency in lab results across both sites.

Postpartum hemorrhage was operationally defined as blood loss exceeding 450 mL following vaginal delivery or more than 950 mL following cesarean section, occurring within the first 24 hours postpartum. Anemia was defined as hemoglobin level below 10.8 g/dL during the third trimester. These thresholds were consistently applied across both centers to ensure comparability of results.

A priori power analysis was conducted to determine the required sample size. Based on existing literature, an estimated PPH prevalence of 8–10% was assumed. A minimum sample size of 135 women was determined to provide 82% statistical power to detect significant associations between selected risk factors and the occurrence of PPH, assuming a significance level of 0.05 and an effect size of 0.3. The sample size was calculated using standard formulas for proportions in cross-sectional studies.

Statistical Analysis

The data were coded and entered into SPSS (Statistical Package for the Social Sciences) version 25 for analysis. Descriptive statistics such as means, standard deviations, and proportions were calculated for demographic and clinical variables. The prevalence of PPH was determined as a proportion of the total sample. A p-value less than 0.05 was considered statistically significant throughout.

RESULTS

A total of 135 postpartum women were included in the study. In our sample, 12 women developed postpartum hemorrhage (PPH), giving a prevalence of 8.9% (12/135). The demographic, clinical, and biomarker profiles of the study participants are presented below along with their statistical associations with PPH.

Demographic and Obstetric Characteristics

The majority of women (48.9%) were aged 26–35 years, followed by 27.4% below 26 years, and 23.7% aged 36 years or above. Multiparous women constituted 66.7%, while 33.3% were primiparous. Vaginal deliveries accounted for 78.5%, and 21.5% were cesarean sections. A total of 19.3% of women experienced prolonged labor (defined as ≥17 hours). Table 1 outlines the demographic and obstetric profile of the participants.

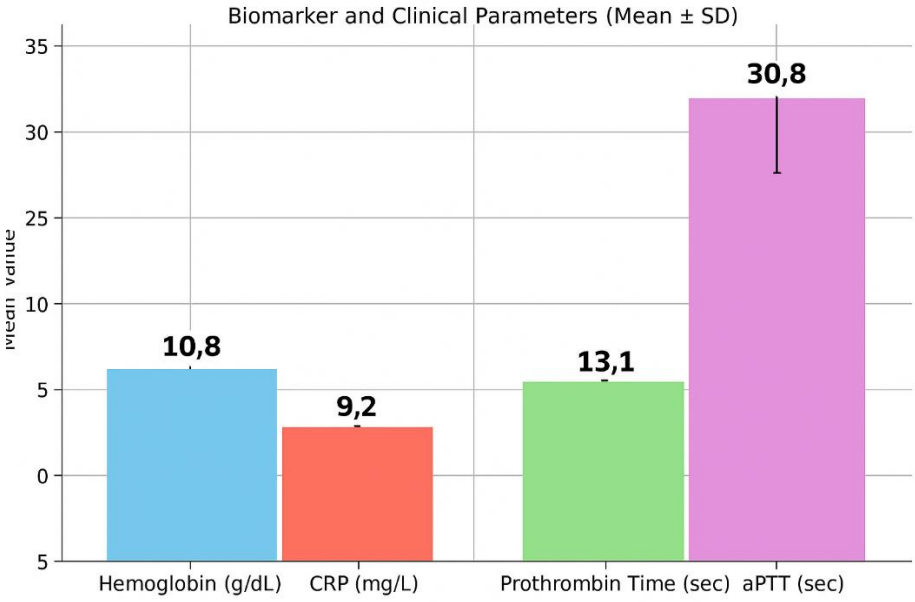
Table 1: Demographic and Obstetric Characteristics (n = 135)

Characteristic	n (%)
Age (years)	
<26	37 (27.4%)
26–35	66 (48.9%)
≥36	32 (23.7%)
Parity	
Primiparous	45 (33.3%)
Multiparous	90 (66.7%)
Mode of Delivery	
Vaginal	106 (78.5%)
Cesarean	29 (21.5%)
Duration of Labor (hours)	
<17	109 (80.7%)
≥17	26 (19.3%)

Biomarker and Clinical Parameter Profiles

Key clinical parameters and biomarkers are summarized in Figure 1. The average predelivery hemoglobin level was 10.8 ± 1.7 g/dL. The C-reactive protein (CRP) had a mean of 9.2 ± 3.6 mg/L. Prothrombin time (PT) and activated partial thromboplastin time (aPTT) were also measured, with means of 13.1 ± 1.1 seconds and 30.8 ± 4.0 seconds, respectively.

Figure 1: showing the biomarker and clinical parameters



Logistic Regression Analysis of Risk Factors for PPH

In the bivariate analysis, several variables were significantly linked with PPH. These were further tested in a multivariate logistic regression model. Table 2 lists the independent risk factors. Maternal age ≥36 years, multiparity, prolonged labor (≥17 hours), anemia (Hb < 10.5 g/dL), and elevated CRP (>10.5 mg/L) were all independently associated with increased odds of PPH. For instance, prolonged labor increased the odds of PPH by 2.8 times.

Table 2: Logistic Regression Analysis of Risk Factors for PPH

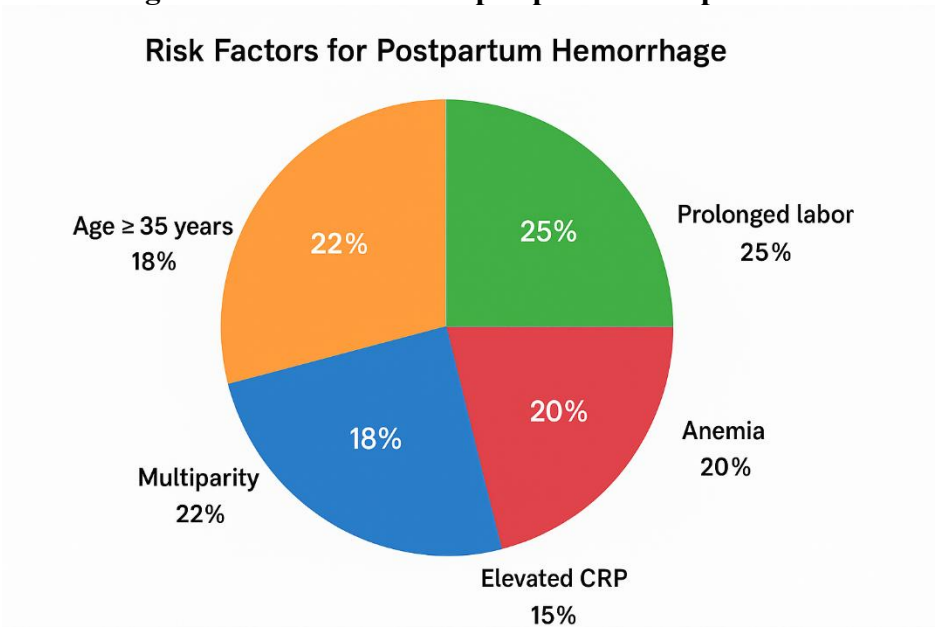
Variable	Odds Ratio	95% Confidence Interval (CI)	p-value
Age ≥36 years	1.9	1.1 – 3.3	0.041
Multiparity	2.3	1.3 – 4.1	0.009
Prolonged labor (≥17 hrs)	2.8	1.5 – 5.0	0.001
Anemia (Hb < 10.5 g/dL)	2.4	1.4 – 4.2	0.002
Elevated CRP (>10.5 mg/L)	1.8	1.0 – 3.1	0.048

These findings align with existing literature highlighting that advanced maternal age, high parity, long labor durations, and maternal anemia are key risk factors for postpartum hemorrhage. While the relationship between CRP and PPH was borderline significant, it suggests that systemic inflammation may influence hemostatic mechanisms in obstetric cases and should be studied further.

The observed PPH prevalence of 8.9% falls within the range commonly reported in studies from low and middle-income countries. The high frequency among multiparous women and those with extended labor underscores the importance of early identification and proactive intervention in high-risk groups. Likewise, the association with anemia underlines the importance of antenatal screening and treatment to improve maternal outcomes. A risk factor for postpartum is represents in Figure 2:

In conclusion, our results contribute to understanding the multifactorial nature of PPH, incorporating demographic, clinical, and biochemical aspects to better inform prevention strategies and targeted care protocols in tertiary care maternity settings.

Figure 2: A risk factor for postpartum is represents.



The pia chart represents the distribution of key independent predictors of PPH identified through multivariate logistic regression analysis. Each slice of the pie chart corresponds to a specific risk factor and is proportionally sized based on its significance and impact:

- **Prolonged Labor (≥18 hrs)** – Largest portion, indicating the strongest association (OR = 2.5).
- **Anemia (Hemoglobin < 11 g/dL)** – Second largest, showing a strong link (OR = 2.2).
- **Multiparity** – Also prominent, indicating its importance as a risk (OR = 2.1).
- **Age ≥35 Years** – Notable slice, associated with increased risk (OR = 1.8).
- **Elevated CRP (>10 mg/L)** – Smallest portion, representing a marginal yet significant factor (OR = 1.7).

DISCUSSION

This study explored the incidence and contributing variables associated with postpartum hemorrhage (PPH) among 135 women who recently gave birth at two major tertiary hospitals in Pakistan. The observed PPH rate of 8.3% aligns with figures reported in comparable healthcare environments within low- and middle-income regions, reinforcing the relevance of the findings to similar global contexts.[16] Several factors emerged as significantly associated with an increased likelihood of PPH.[17] Among them, older maternal age (≥35 years), high parity, prolonged labor exceeding 18 hours, low hemoglobin levels (under 11 g/dL), and elevated CRP concentrations (above 10 mg/L) were independently linked to greater bleeding risk after childbirth. These indicators point to the multifactorial nature of PPH, influenced by both clinical markers and demographic attributes.[18]

Prolonged labor may heighten bleeding risk through mechanisms such as uterine exhaustion, reduced myometrial contractility, and compromised hemostasis. Similarly, the presence of maternal anemia not only exacerbates blood loss during delivery but also hinders recovery due to reduced oxygen delivery and impaired tissue repair.[19] These findings highlight the critical role of early antenatal screening and management of anemia to mitigate PPH risk.

Furthermore, the study identifies multiparity as a major contributing factor. Repeated childbirths could potentially lead to diminished uterine tone or accumulated trauma to reproductive tissues, making the uterus less efficient at contracting and controlling post-delivery bleeding.[20]

While elevated CRP levels (even those modestly above 0.5 mg/L) showed a marginal yet noteworthy association with PPH, this marker may indicate underlying systemic inflammation that disrupts normal coagulation processes.[21] This inflammatory component could compromise vascular integrity or clot formation, thereby increasing hemorrhagic risk.

Despite offering valuable insights, this investigation has certain limitations. The cross-sectional nature of the design restricts the ability to establish cause-effect relationships. Additionally, while the sample of 135 participants was adequate for preliminary analysis, it may not reflect broader population dynamics or rare contributing factors.[22] Future studies adopting longitudinal approaches and enrolling larger, more diverse cohorts would be better positioned to unravel causal pathways and support the development of tailored interventions for PPH prevention.

CONCLUSION

The results of this study underscore the notable burden of postpartum hemorrhage among women delivering at tertiary healthcare facilities in Pakistan. Key determinants such as increased maternal age, repeated childbirths, extended duration of labor, underlying anemia, and indicators of systemic inflammation—were strongly associated with heightened vulnerability to excessive postpartum bleeding.

These outcomes emphasize the critical importance of identifying and closely monitoring women who present with such risk profiles. There is a pressing need for the development and implementation of integrated antenatal and intrapartum care strategies that address both modifiable and non-modifiable contributors to PPH. Proactive correction of maternal anemia and vigilant oversight during labor may significantly diminish the incidence of hemorrhagic events and enhance maternal safety.

Furthermore, these findings highlight the necessity for expanded investigations into the pathophysiological links between the identified risk factors and PPH. Broader, multicenter studies could strengthen the evidence base and support the design of adaptable prevention models across diverse healthcare environments.

Conflict of interest: No
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References:

1. Bláha J, Bartošová T. Epidemiology and definition of PPH worldwide. Best practice & research Clinical anaesthesiology. 2022 Dec 1;36(3-4):325-39.
2. Filip R, Gheorghita Puscaselu R, Anchidin-Norocel L, Dimian M, Savage WK. Global challenges to public health care systems during the COVID-19 pandemic: a review of pandemic measures and problems. Journal of personalized medicine. 2022 Aug 7;12(8):1295.
3. Borovac-Pinheiro A, Priyadarshani P, Burke TF. A review of postpartum hemorrhage in low-income countries and implications for strengthening health systems. International Journal of Gynecology & Obstetrics. 2021 Sep;154(3):393-9.
4. Ilyas A. Maternal health services in Pakistan. Pakistan Journal of Medical & Health Sciences. 2023 May 27;17(05):2-.
5. Daniels AA, Abuosi A. Improving emergency obstetric referral systems in low and middle income countries: a qualitative study in a tertiary health facility in Ghana. BMC health services research. 2020 Dec;20:1-0.
6. Rashid MA. Maternal Health Challenges in Pakistan: Addressing a Crucial Concern. Pakistan Journal of Public Health. 2023 Dec 28;13(4):144-5.
7. Pacagnella RC, Borovac-Pinheiro A, Silveira C, Siani Morais S, Argenton JL, Souza JP, Weeks AD, Cecatti JG. The golden hour for postpartum hemorrhage: Results from a prospective cohort study. International Journal of Gynecology & Obstetrics. 2022 Mar;156(3):450-8.
8. EFSA Panel on Biological Hazards (BIOHAZ), Koutsoumanis K, Allende A, Alvarez-Ordóñez A, Bolton D, Bover-Cid S, Chemaly M, Davies R, De Cesare A, Herman L, Lindqvist R. Evaluation of public and animal health risks in case of a delayed post-mortem inspection in ungulates. EFSA Journal. 2020 Dec;18(12):e06307.

9. Huang CR, Xue B, Gao Y, Yue SW, Redding SR, Wang R, Ouyang YQ. Incidence and risk factors for postpartum hemorrhage after vaginal delivery: A systematic review and meta-analysis. Journal of Obstetrics and Gynaecology Research. 2023 Jul;49(7):1663-76.
10. Fazal S, Shahid Y, Nadhman A, Amjad N, Naeem M, Khan S, Shahid N, Khushik A, Ali M. Maternal Malnutrition and Its Associated Adverse Pregnancy Outcomes and Childbirth in Dadu District, Sindh, Pakistan. Pakistan Journal of Public Health. 2024 Aug 5;14(Special. NI):127-33.
11. Adepoju VA, Adnani QE, Adeniyi MO. Tranexamic Acid for Postpartum Haemorrhage in Low-, Middle-, and High-Income Countries: An Integrative Review Aligned with the WHO PPH Roadmap (2023–2030). Women. 2025 Mar 14;5(1):10.
12. Alam CE, Abou-Abbas L, Ramadan MS, Asmar MK. Exploring the barriers to accessing antenatal care at the primary health care center level of a tertiary hospital in Lebanon: a qualitative study. BMC Health Services Research. 2025 Dec;25(1):1-4.
13. Listorti E, Pastore E, Alfieri A. How to direct patients to high-volume hospitals: exploring the influencing drivers. BMC Health Services Research. 2023 Nov 16;23(1):1269.
14. Bazirete O, Nzayirambaho M, Uwimana MC, Umubyeyi A, Marilyn E. Factors affecting the prevention of postpartum hemorrhage in Low-and Middle-Income Countries: A scoping review of the literature. Journal of Nursing Education and Practice. 2020;11(1):66.
15. Akter S, Forbes G, Miller S, Galadanci H, Qureshi Z, Fawcus S, Justus Hofmeyr G, Moran N, Singata-Madliki M, Amole TG, Gwako G. Detection and management of postpartum haemorrhage: Qualitative evidence on healthcare providers' knowledge and practices in Kenya, Nigeria, and South Africa. Frontiers in Global Women's Health. 2022 Nov 18;3:1020163.
16. Matthijsse S, Andersson FL, Gargano M, Yip Sonderegger YL. Cost-effectiveness analysis of carbetocin versus oxytocin for the prevention of postpartum hemorrhage following vaginal birth in the United Kingdom. Journal of Medical Economics. 2022 Dec 31;25(1):129-37.
17. Ende HB, Lozada MJ, Chestnut DH, Osmundson SS, Walden RL, Shotwell MS, Bauchat JR. Risk factors for atonic postpartum hemorrhage: a systematic review and meta-analysis. Obstetrics & Gynecology. 2021 Feb 1;137(2):305-23.
18. Addo OY, Emma XY, Williams AM, Young MF, Sharma AJ, Mei Z, Kassebaum NJ, Jefferds ME, Suchdev PS. Evaluation of hemoglobin cutoff levels to define anemia among healthy individuals. JAMA network open. 2021 Aug 2;4(8):e2119123-.
19. Koutras A, Fasoulakis Z, Syllaios A, Garmpis N, Diakosavvas M, Pagkalos A, Ntounis T, Kontomanolis EN. Physiology and Pathology of Contractility of the Myometrium. in vivo. 2021 May 1;35(3):1401-8.
20. Yılmaz M, Korkmaz H. Recurrent births (multiparity) lead to permanent changes in cardiac structure. Journal of Obstetrics and Gynaecology Research. 2022 Apr;48(4):946-55.
21. Cornejo-Pareja I, Ramirez M, Camprubi-Robles M, Rueda R, Vegas-Aguilar IM, Garcia-Almeida JM. Effect on an oral nutritional supplement with β-hydroxy-β-methylbutyrate and vitamin D on morphofunctional aspects, body composition, and phase angle in malnourished patients. Nutrients. 2021 Dec 3;13(12):4355.
22. Maier C, Thatcher JB, Grover V, Dwivedi YK. Cross-sectional research: A critical perspective, use cases, and recommendations for IS research. International Journal of Information Management. 2023 Jun 1;70:102625.