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IFA compliance and associated factors among postpartum mothers: a cross-sectional analytical study at public health facilities in Bharatpur metropolitan city, Chitwan Nepal

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ABSTRACT

Objectives Iron deficiency anaemia and inadequate compliance with iron–folic acid (IFA) supplementation among pregnant and postpartum women pose substantial public health challenges in Nepal. Hence, this study aimed to determine IFA compliance and identify associated factors among postpartum mothers in Bharatpur Metropolitan City, Chitwan, Nepal.

Design An analytical cross-sectional design was employed.

Setting This study was conducted in Bharatpur Metropolitan City, Chitwan, Nepal.

Participants A total of 286 postpartum mothers were selected using non-probability purposive sampling. Ethical approval was obtained from the Institutional Review Committee of Shree Medical and Technical College, and informed consent was obtained from all participants before data collection. Semi-structured questionnaires were administered through face-to-face interviews to collect data and ensure an in-depth understanding of the participants' responses.

Results Among the 286 participants, 53.5% demonstrated compliance with the IFAs. Multivariable logistic regression showed that compliance was significantly and positively linked to the level of education ((AOR)=3.629; 95% CI: (1.438 to 9.153)) and knowledge regarding IFAs (AOR=3.751; 95% CI: (2.145 to 6.562)). The reasons for non-compliance included the consumption of too many tablets, lack of information provided by healthcare workers, experiencing side effects and forgetting to take the tablets.

Conclusions IFA compliance was observed in more than half of the participants. Compliance was influenced by participants' education and knowledge. The authors hold a strong conviction that relevant authorities can provide the necessary education in specific areas of concern to enhance the design and improvement of IFA programme strategies.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ It used a cross-sectional analytical design with a well-defined sample.
⇒ This study used inferential methods and logistic regression to strengthen the findings.
⇒ The study was conducted in selected public health facilities, which may have limited the generalisability of the findings due to the exclusion of private-sector facilities.
⇒ Recall bias may have led participants to overestimate or underestimate their knowledge of daily iron–folic acid supplementation.

INTRODUCTION

Pregnancy exerts a substantial impact on both maternal well-being and offspring. The augmented requisites of iron–folic acid (IFA) supplementation during gestation play a pivotal role in mitigating risks to both maternal and neonatal health, particularly in preventing maternal iron deficiency anaemia (IDA) and the concomitant risk of low birth weight.[1 2] IDA is a significant global public health problem, affecting pregnant women,[3–6] postpartum women and children alike.[7 8] To address this issue, the WHO has advised daily oral folic acid supplementation with 30 mg to 60 mg of elemental iron and 400 µg (0.4 mg) of folic acid during pregnancy to prevent maternal anaemia, puerperal sepsis, low birth weight and preterm birth.[9] To address IDA, the Government of Nepal has been providing IFA to pregnant and postpartum women since 1998 and recommended that they consume the supplements for 225 days starting from their second trimester.[10]

Globally, anaemia affected 46% of pregnant women in 2016 and accounted for 20% of all maternal deaths.[11] Every year, 115 000 maternal and 591 000 prenatal deaths occur due to IDA.[12 13] The WHO issued a target to reduce anaemia among women of reproductive age by 50% by 2025.[14 15] The targets within

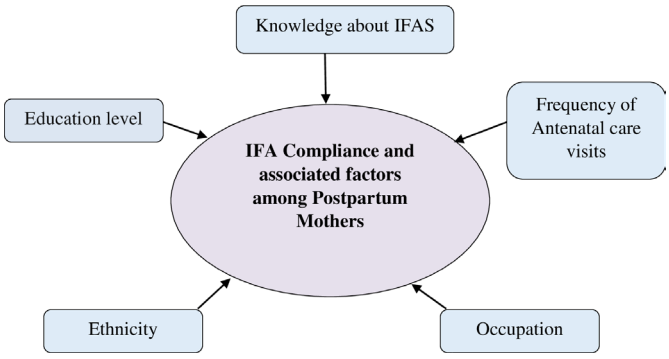

Figure 1 Factors associated with iron and folic acid supplementation compliance. IFA, iron–folic acid supplementation.

the WHO's Sustainable Development Goal 2 (SDG-2) are aimed at reducing various forms of malnutrition among children under 5 years old, pregnant women, lactating mothers, adolescent girls and older individuals.[16] IDA is a serious public health issue in South and Southeast Asia where 52% of pregnant mothers are still suffering from the condition.[11] Evidence suggests that IFA during pregnancy reduces the incidence of anaemia.[17]

In Nepal, health workers have been actively addressing the problem of IDA; however, it remains a significant challenge. This health condition is manifested in different ways across the country and influenced by factors like politics and geography.[10 18] Health sector or client-related factors are the main reason for poor IFA compliance in developing countries.[19] IDA is one of the major nutritional concerns in Nepal.[12] Several interventional activities have been implemented to combat the problem, but its status has not been improved[13 20] due to IFA non-compliance.[18] Although increasing IFA has been a top priority programme in Nepal, the prevalence of IDA remains high.[13 21] Bharatpur Metropolitan City has a sufficient number of health facilities, but it has higher IFA non-compliance compared with the national level.[22] This finding highlights the existence of a research gap necessitating comprehensive investigation. Hence, this study aimed to identify IFA compliance and associated factors among postpartum mothers attending public health facilities in Bharatpur Metropolitan City (figure 1).

MATERIALS AND METHODS

Research design and study area

This institution-based, analytical, cross-sectional study was conducted with 286 postpartum mothers from December 2021 to August 2022. Participants were recruited from one Maternal and Child Health (MCH) clinic, one primary healthcare centre, eight health posts and two basic health service centres recognised as public health facilities in Bharatpur Metropolitan City, Chitwan. These facilities were equipped to provide basic health services aimed at enhancing community well-being and preventing the spread of disease.

Sampling and sample size

A non-probability purposive sampling technique was used to select postpartum mothers attending these health facilities for their child's first diphtheria, pertussis and tetanus (DPT) vaccine. However, mothers who were unwilling or unable to respond and caregivers who responded on behalf of the mothers were excluded from the study. The sample size was determined using the Cochran formula,[23] $((n)=z^2pq/d^2)$, with a 95% CI, an estimated prevalence of 42%[18] based on prior research, and an allowable error of 6.0%. This calculation yielded an initial sample size of 260, which was later adjusted to 286 after estimating a 10% non-response rate.

Patient and public involvement

The study population was involved in the study from the start, and their perspectives on the importance of IFA compliance information were gathered. The research questions were developed with response from the study population and finalised following pretesting. Participation was voluntary and respondents were informed of their right to withdraw from the interview at any time.

Data collection technique

The data collection process was conducted by the researcher from 23 March 2022 to 24 April 2022. Data were collected using a semi-structured questionnaire comprising six distinct sections. These sections covered sociodemographic information, obstetric and postnatal care, knowledge of IFA, consumption patterns and reasons for IFA compliance and non-compliance. Participants' knowledge was assessed regarding the identification of preventable diseases associated with the intake of IFA, determination of available sources, initiation and duration of IFA tablet consumption, quantity of supplements consumed during the antenatal and postnatal periods and awareness of side effects. A scoring system was employed, with correct responses scored as 1 and non-responses or incorrect responses scored as 0. Finally, the summative scores were categorised as poor or good knowledge.[24] IFA compliance was assessed based on participant compliance with the prescribed dosage and intake regimen, as reported during the data collection process.

Reliability, validity and ethical clearance

To ensure comprehensibility, consistency and validity, the questionnaire was initially developed in English, translated into Nepali, and then back-translated into English by a university lecturer. Pretesting involving 10% of the sample size (ie, 29 participants) was conducted at an MCH clinic, leading to necessary refinements by the researcher.

Before data collection, the research objectives were thoroughly explained and written informed consent was obtained from each participant. The principles of privacy, confidentiality and anonymity were strictly adhered to, granting participants autonomy to decline participation or withdraw from the study at any point. The study was

Table 1 Sociodemographic findings (n=286)

Variables	Number (n)	Per cent (%)
Religion		
Hindu	235	82.2
Buddhist	43	15
Muslim and Christian	8	2.7
Ethnicity		
Janajati	111	38.8
Brahmin/Chetteri	108	37.8
Dalit	38	13.3
Others (Madhesi, Muslim)	29	10.1
Family type		
Nuclear family	108	37.8
Joint family	178	62.2
Education		
Literate	280	97.9
Illiterate	6	2.1
Literacy level achieved (n=280)		
Basic level and below	63	22.1
Secondary level	126	45
Higher secondary and above	92	32.9
Occupation		
Homemaker	170	59.4
Service	48	16.8
Business	30	10.5
Agriculture	29	10.1
Others (student and daily wages)	9	3.1

approved by the Institutional Review Committee of Shree Medical and Technical College (SMTC-IRC) (Reference: SMTC-IRC-20220214–92), and proper permission to conduct the study was acquired from the relevant authorities.

Data analysis plan

Following data collection, a meticulous process of data entry, cleaning and validation was performed to ensure the accuracy and reliability of the data. The SPSS Version 26 software was used for subsequent analysis. Descriptive statistical techniques, such as frequencies, percentages, means and SD, were used along with inferential methods, including χ^2, Fisher's exact tests and bivariate and multivariable logistic regression analyses, to derive meaningful conclusions from the collected data.

RESULTS

Demographic, obstetric and postnatal related characteristics

Among the 286 participants, most participants were Hindus (82.2%) and belonged to joint families (62.2%). Almost all participants (97.9%) were literate and 59.4% were engaged in household work (table 1).

More than half of the participants were multigravida (54.5%) or primiparous (55.6%). Almost all participants (98.6%) visited health facilities for antenatal care (ANC), whereas 93.0% visited health facilities for postnatal check-ups (PNC). Among those who visited health facilities for ANC checkups, 63.5% visited government health facilities. Additionally, 17.1% reported a history of abortion, and a high percentage of mothers delivered their babies in a government health facility (82.5%) with the majority having normal deliveries (68.5%) (table 2).

IFA compliance

The study revealed that 53.5% (95% CI: 47.8 to 59.2) of participants complied with the recommended IFA (ie, they consumed the recommended dose of 225 tablets) during the pregnancy and postpartum period (figure 2).

The primary factors contributing to IFA compliance included proper counselling by healthcare professionals (65.4%), awareness of the associated benefits (82.4%), understanding anaemia prevention (51.6%), support from family members (43.1%) and availability of cost-free tablets (42.5%). In contrast, the reasons for non-compliance included concerns about consuming too many tablets (35.3%), lack of information provided by healthcare workers (34.6%), experiencing side effects (24.8%) and forgetting to take the tablets (21.1%).

Furthermore, nearly all participants (99.0%) adhered to the recommended IFA during pregnancy. Most (98.5%) commenced IFA on the first day of the second trimester, and approximately half (54.1%) continued until day 45 of the postnatal period. Most participants (82.3%) took IFA before bedtime, and 63.3% reported side effects, notably black stools. However, only a minority (20.0%) sought assistance from healthcare facilities to address these adverse effects (table 3).

Participants' knowledge was assessed regarding the identification of preventable diseases associated with IFA, identification of accessible sources of IFA, initiation and duration of IFA, quantity of IFA throughout the antenatal and postnatal phases and awareness of associated side effects. The findings revealed that 56.3% of the respondents displayed good knowledge, whereas the remaining 43.7% exhibited poor knowledge.

Factors associated with compliance with IFA among postpartum mothers

A significant association was observed between IFA compliance and several key factors. A significant association was revealed between IFA compliance and ethnicity (p=0.003), education level (p<0.001), occupation (p=0.019), frequency of ANC visits (p=0.036), knowledge level (p<0.001) and initiation of IFA (p<0.001). Moreover, individuals in the Brahmin/Chetteri ethnic group exhibited the highest compliance (64.8%). Among those receiving services, 70% demonstrated compliance. Additionally, compliance increased with higher levels of

Table 2 Obstetric and PNC-related characteristics of respondents (n=286)

Variables	Number (n)	Per cent (%)
Gravidity		
Primigravida	130	45.5
Multigravida	156	54.5
Parity		
Primipara	159	55.6
Multipara	127	44.4
ANC check-up during current pregnancy		
Yes	282	98.6
No	4	1.4
Number of antenatal care visits (n=282)		
<4 visits	27	9.6
≥4 visits	255	90.4
Location of ANC check-up (n=282)		
Government health institution	179	63.5
Private health institution	103	36.5
Time taken to reach health facility (n=282)		
<30 min	189	67
≥30 min	93	33
Previous history of abortion		
Yes	49	17.1
No	237	82.9
Place of delivery of the last child		
Home	6	2.1
Government hospital	236	82.5
Private hospital	44	15.4
Type of delivery		
Normal	196	68.5
Surgical	90	31.5
Postnatal care check-up		
Yes	20	7
No	266	93

ANC, antenatal check-up; PNC, postnatal check-up.

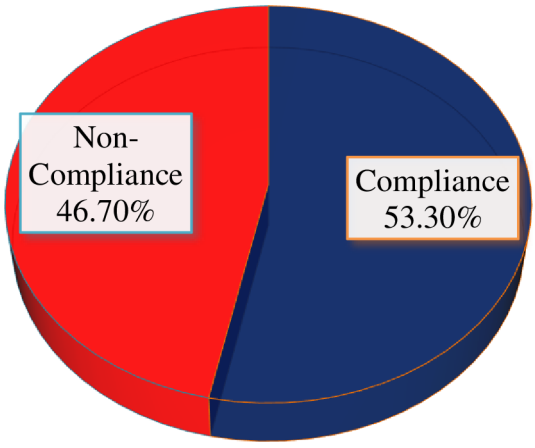

Figure 2 Proportion of compliance and non-compliance of intake of IFA tablets. IFA, iron–folic acid supplementation.

education. In addition, participants who received ANC four or more times had significantly higher IFA compliance (56.1%) (p=0.036). Likewise, 68.6% of those with good knowledge demonstrated IFA compliance, whereas 56.5% of those who initiated consumption of IFA at 4 months of gestation demonstrated compliance (table 4).

Multivariable analysis of IFA compliance among postpartum mothers

The study employed both bivariate and multivariable logistic regression analyses to achieve its research objectives. In the bivariate analysis, all factors were assessed; among them, only eight demonstrated statistically significant associations with compliance. These significant

Table 3 Consumption of IFA and its side effects (n=286)

Variables	Number (n)	Per cent (%)
Consumed IFA during pregnancy		
No	3	1
Yes	283	99
Starting of IFA consumption (n=283)		
4th month of gestation	271	95.8
5th month of gestation	7	2.5
6th month of gestation	2	0.7
8th month of gestation	3	1.1
Intake timing of IFA (n=283)		
Morning	35	12.4
Before bedtime	233	82.3
No fixed schedule	15	5.3
Perceived side effects of IFA (n=283)		
Yes	119	42
No	164	58
Side effects* (n=119)		
Black stool	76	63.3
Constipation	69	57.5
Nausea	29	24.2
Epigastric pain	17	14.2
Visited the health facility to manage side effects		
Yes	24	20
No	95	80
Duration of IFA		
Until the delivery of the baby	85	30.1
Delivery to less than 45 days postnatal	45	15.9
Until 45 days postnatal	153	54.1

*Multiple responses.
IFA, iron–folic acid supplementation.

Table 4 Factors associated with IFA compliance

Sociodemographic characteristic	Compliance n (%)	Non-compliance n (%)	P value
Ethnicity			
Dalit	12 (33.3)	24 (66.7)	0.003*
Janajati	53 (48.2)	57 (51.8)	
Brahmin/Chetteri	70 (64.8)	38 (35.2)	
Others (Madhesi, Muslim)	18 (62.2)	11 (37.9)	
Education			
Illiterate	5 (83.3)	1 (16.7)	0.063†
Literate	125 (45.1)	152 (54.9)	
Education level (n=280)			
Read and write only	2 (28.6)	5 (71.4)	<0.001*
Basic level and below	24 (40.7)	35 (59.3)	
Secondary level	58 (46.0)	68 (54.0)	
Higher secondary and above	70 (76.1)	22 (23.9)	
Occupation			
Homemaker	84 (50.0)	84 (50.0)	0.019*
Agriculture	19 (67.9)	9 (32.9)	
Service	34 (70.8)	14 (29.2)	
Business	13 (43.3)	17 (56.7)	
Others (daily wages, students)	3 (33.3)	6 (66.7)	
Number of antenatal care visits			
<4 visits	9 (34.6)	17 (65.4)	0.036†
≥4 visits	142 (56.1)	111 (43.9)	
Level of knowledge			
Poor knowledge	44 (35.5)	80 (64.5)	<0.001†
Good knowledge	109 (68.6)	50 (31.4)	
Starting time of IFA consumption			
4th month of gestation	153 (56.5)	118 (43.5)	<0.001†
≥5th month of gestation	0 (0.0)	12 (100.0)	

*p value from Fisher's exact test.
†p value from χ^2 test.
IFA, iron–folic acid supplementation.

variables, with a p value <0.10, were subsequently entered into multivariable logistic regression analysis.

In the multivariate analysis, the Nagelkerke R^2 value indicated that approximately 26.0% of the variability in IFA compliance was explained by factors associated with the model. Additionally, the Hosmer–Lemeshow test yielded a value of 0.178, implying that the model exhibited a good fit for prediction purposes.

In the multivariate logistic regression analysis, two predictors emerged as significantly associated with IFA compliance. The multivariable analysis indicated that participants who had higher secondary and above-level education were 3.629 times more likely to comply than those with basic education and below (AOR=3.629; 95% CI: (1.438 to 9.153)), and those who had good knowledge about IFA were 3.751 times more likely to comply than those who had poor knowledge (AOR=3.751; 95% CI: (2.145 to 6.562) (table 5).

DISCUSSION

The current study revealed that more than half of the participants complied with IFA while approximately half of them showed non-compliance. This trend was consistent with studies conducted in Ethiopia,[5 24 25] Southern Senegal[26] and Nepal.[12 21] In contrast, compliance in the current study was higher than that in other studies from Ethiopia,[7 8 27 28] Tanzania[29] and Kenya,[19] possibly due to variations in socioeconomic status, timeframes, health-seeking behaviours, knowledge levels, healthcare service quality and counselling.

Table 5 Multivariable analysis of factors affecting IFA compliance

Factors affecting IFA compliance	Compliance n (%)	Non-compliance n (%)	COR (95% CI)	AOR (95% CI)
Ethnicity				
Dalit	12 (33.3)	24 (66.7)	1	1
Janajati	53 (48.2)	57 (51.8)	1.860 (0.846 to 4.087)	1.027 (0.403 to 2.621)
Brahmin/Chetteri	70 (64.8)	38 (35.2)	3.684* (1.659 to 8.180)	1.340 (0.491 to 3.655)
Others (Madhesi, Muslim)	18 (62.1)	11 (37.9)	3.273* (1.179 to 9.087)	2.307 (0.702 to 7.580)
Among literate, level of education (n=280)				
Basic level and below	24 (40.7)	35 (59.3)	1	1
Secondary level	58(46)	68(54)	1.244 (0.665 to 2.327)	1.231 (0.574 to 2.641)
Higher Secondary and above	70 (76.1)	22 (23.9)	4.640* (2.289 to 9.406)	3.629* (1.438 to 9.153)
Occupation				
Homemaker	84(50)	84(50)	1	1
Agriculture	19 (67.9)	9 (32.1)	2.111 (0.903 to 4.933)	1.951 (0.747 to 5.092)
Service	34 (70.8)	14 (29.2)	2.429* (1.216 to 4.851)	0.951 (0.413 to 2.188)
Business	13 (43.3)	17 (56.7)	0.765 (0.350 to 1.673)	0.594 (0.247 to 1.430)
Others (Student, Daily wages)	3 (33.3)	6 (66.7)	0.500 (0.121 to 2.065)	0.406 (0.077 to 2.149)
Number of antenatal care visits (n=282)				
< 4 visits	9 (34.6)	17 (65.4)	1	1
≥4 visits	142 (56.1)	111 (43.9)	2.416* (1.038 to 5.627)	1.597 (0.619 to 4.122)
Level of knowledge				
Poor knowledge	44 (35.5)	80 (64.5)	1	1
Good knowledge	109 (68.6)	50 (31.4)	3.964* (2.410 to 6.518)	3.751* (2.145 to 6.562)

Hosmer and Lemeshow test=0.178.
*Statistically significant at p value<0.05; 1=reference group.
AOR, adjusted odds ratio; COR, crude odds ratio; IFA, iron–folic acid supplementation.

In this study, knowledge about IFA benefits and health worker counselling emerged as key factors associated with high compliance, aligning with studies from Ethiopia.[7 25] Notably, compliance was considerably higher than that in the study conducted in Kathmandu, Nepal.[30] Nevertheless, a substantial proportion of participants cited excessive tablet consumption as a reason for non-compliance, which contrasted with findings from Ethiopia[3 25 31] and Nepal.[30]

This study showed that participant ethnicity was significantly associated with IFA compliance: mothers of the Brahmin/Chetteri ethnicity were three times more likely to comply with IFA than those of the Dalit ethnicity, which was similar to the findings of a study conducted in Pokhara, Nepal.[12] The results of the analysis suggested that individuals of Brahmin/Chetteri ethnicity exhibit higher levels of education, which may have contributed to this finding.

Similarly, educational level showed a significant association with IFA compliance, and those who had higher secondary and above-level education were three times more likely to comply with IFA than respondents who had a basic level and below. This finding is in line with a study conducted in Ethiopia.[3 7] A possible explanation is that education may enhance women's awareness of micronutrient deficiencies, methods to address them, understanding IDA risk during pregnancy, benefits of consuming IFA for both the mother and fetus and compliance with IFA intake during pregnancy.

Likewise, the occupation of participants was significantly associated with IFA compliance, and those who were employed in service work were two times more likely to comply with IFA than those who were homemakers, which was consistent with the findings of a study conducted in Sri Lanka.[32] One possible explanation is that women involved in service work may have better access to health information due to their exposure to workplace wellness programmes, health insurance benefits, colleague interactions and financial independence to purchase supplements.

The number of antenatal care visits was significantly associated with IFA compliance; those with≥4 visits were twice as likely to comply compared with those with<4 visits, consistent with a study conducted in Ethiopia.[4 27 31] A possible explanation is that pregnant women may receive guidance from healthcare professionals on the benefits of IFA, compliance encouragement and the risks of non-compliance to both the mother and fetus.

Finally, strong knowledge about IFA was significantly correlated with compliance, as those who were well informed were three times more likely to comply, aligning with findings from Tanzania[29] and Ethiopia.[4 5 24 27 33] The primary factor contributing to this compliance may be the elevated level of participant knowledge, which correlated with their educational attainment.

Conclusion

In this study, 53.5% of the participants were compliant with IFA recommendations. The results revealed that higher secondary education and higher education levels were strongly associated with greater IFA compliance. Importantly, the findings reinforce the critical connection between knowledge and compliance, as participants with good knowledge of IFAs exhibited notably higher compliance. We hold a strong conviction that relevant authorities can provide the necessary education in specific areas of concern to enhance the design and improvement of IFA programme strategies.

Limitations of the study

The cross-sectional analytical design of this study limits the ability to draw causal inferences. Additionally, focusing on public-sector health facilities restricts the generalisability of the findings to private-sector facilities and community settings. Moreover, the inclusion of postpartum mothers attending their child's first DPT vaccination introduces the potential for recall bias regarding IFA compliance during pregnancy and postpartum. Finally, the reliance on self-reported data to assess compliance may introduce uncertainty and affect the accuracy of the results.

Practical implication, recommendation and future research

Despite these limitations, this study has several programmatic implications. First, we provide baseline information on the compliance rates for IFA in the Chitwan District of Nepal. Second, we identify the factors associated with IFA compliance. Third, we identify the reasons for IFA non-compliance.

The Government of Nepal has implemented several programmes to improve the intake of iron and folic acid among pregnant and postpartum women, such as the Intensification of Maternal and Neonatal Micronutrient Programme, National Strategy for the Control of Anaemia in Women and Children and Iron Supplementation Programme. We recommend that concerned authorities update the information used to design IFA programme policies and strategies.

We also recommend conducting large-scale, comprehensive and well-designed studies on IFA compliance in private health facilities and rural communities in Nepal, where compliance may present an unseen programmatic challenge to improving MCH.

Contributors JKP is responsible for the overall content as a guarantor. SK and JKP developed the conceptualisation of the idea; SK collected the data; SP monitored and supported data collection; and GPD analysed the data. Finally, all authors contributed to writing the original draft, validation and editing of the final manuscript. Moreover, all authors equal responsibility for the revision draft of the manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, conduct, reporting or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Consent obtained directly from patient(s).

Ethics approval This study involves human participants and was approved by Shree Medical and Technical College-Institutional Review Committee (SMTC-IRC) Registration no: SMTC-IRC-20220214-92. Participants gave informed consent to participate in the study before taking part.

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