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Knowledge of Pregnancy Danger Signs and Associated Factors Among Pregnant Women Attending Antenatal Care Units in Chamchamal District

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ABSTRACT

Background: Maternal mortality remains high in many low and middle-income areas because complications during pregnancy often go unrecognized. This study aimed to assess pregnant women's knowledge of pregnancy danger signs and identify sociodemographic and obstetric factors linked to their level of awareness.

Methods: A cross-sectional study was conducted with 355 pregnant women attending antenatal care clinics in Chamchamal. The participants were chosen by simple random sampling. Data collection was accomplished using a structured interview-based questionnaire. Knowledge was deemed good if participants could correctly recall seven or more danger signs.

Results: Among the participants, 42.5% had a good level of knowledge, 48.7% had poor knowledge, and 8.7% were not knowledgeable at all. Approximately 20% had never been informed about danger signs, with healthcare providers serving as the primary source of information. Vaginal bleeding and reduced fetal movement were the most recognized signs, whereas persistent vomiting and swelling of the face or limbs were the least recognized. Knowledge was significantly related to age and number of pregnancies, in contrast to education, occupation, and the frequency of antenatal visits.

Conclusion: Knowledge of pregnancy danger signs among women attending antenatal care was suboptimal. Obvious signs like vaginal bleeding and reduced fetal movements were better recognised than other symptoms. Older and multiparous women knew more, while education, employment, and the number of visits showed no effect.

Key words: Pregnancy; Maternal health; Danger signs; Antenatal Care

INTRODUCTION

Knowledge of pregnancy danger signs is a key determinant of timely care seeking and safe motherhood. Pregnancy and childbirth are associated with numerous unexpected outcomes and discomforts for mothers [1].

Globally, numerous women lose their lives due to complications related to childbirth and pregnancy. The World Health Organization (WHO) recorded 295,000 maternal deaths during and after pregnancy in the year 2017 alone [2]. In most of these, the complications arise from poor knowledge of mothers to the danger signs of pregnancy-related complications [3].

These danger signs serve as indicators suggesting potential forthcoming issues in pregnant women throughout all phases of pregnancy, during childbirth, and the postpartum period. Understanding these indicators enables pregnant women and healthcare professionals to detect potential complications early and initiate appropriate interventions to prevent and minimize risks to the mothers [4]. Common danger signs include vaginal bleeding, convulsions or fits, high fever, abdominal pain, severe headaches, blurred vision, absence of fetal movements, a gush of fluid from the vagina, and foul-smelling vaginal discharge, these danger sign increase maternal mortality if treatment is not promptly initiated upon their identification [5].

In addition to women's own knowledge, early identification of danger signs by non-specialist healthcare workers is important, particularly in resource-constrained settings. Strengthening the skills of these providers can help overcome shortages of specialised staff and improve the quality of maternal care [6].

Health education on pregnancy-related topics, including danger signs and appropriate nutrition, delivered through antenatal care (ANC) services and community programmes, is therefore essential to promote timely health-seeking behaviour and prevent adverse outcomes.

Evidence on pregnant women's awareness of danger signs and its determinants in the Kurdistan Region of Iraq remains limited. This study aimed to investigate pregnant women's knowledge of pregnancy danger signs in Chamchamal District and to identify sociodemographic and obstetric factors associated with their level of knowledge.

MATERIALS AND METHODS

This study employed a cross-sectional descriptive study design. it was conducted in Chamchamal District (Shorsh, Sangaw, Chamchamal center, Takiya & Akhjalar), located within the Sulaymaniyah Governorate in the Kurdistan Region of Iraq. The target population for this study comprises pregnant women attending antenatal care (ANC) services at selected public health facilities located within Chamchamal District. The study included women at various stages of pregnancy who are accessing routine ANC services during the study period from February to May 2025.

The sample size for this study was determined to be 355 pregnant women. This number was calculated using Cochran's formula [7]. The calculation assumed a 95% confidence level, a 5% margin of error, and a response distribution of 50%, which provides the maximum variability and yields the largest required sample size for conservative estimation.

The initial sample size was calculated using the single−proportion formula:

$$n_0 = \frac{Z^2 P(1-P)}{e^2},$$

where Z is the standard normal value for the desired confidence level, P is the expected proportion, and e is the margin of error.

$$n_0 = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2} = 385.$$

Because the target population was finite, the sample size was adjusted using:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} = \frac{385}{1 + \frac{384}{4575}} \approx 355.$$

Since the total target population according to Chamchamal Health Authorities was (N = 4,575 women), a finite population correction was applied, which reduced the required number of valid responses to 355.

Applying this formula ensures that the study results will be statistically reliable and generalizable to the broader population of pregnant women attending ANC units in Chamchamal. To select participants, a simple random sampling technique was employed [8].

Data for this study was gathered through a structured interview-administered questionnaire designed specifically to capture relevant information aligned with the study objectives. The use of a structured format ensures uniformity in the data collection process and minimizes interviewer bias, thereby enhancing the reliability and validity of the responses [9]. Participants were assumed to have no knowledge when they could not identify any of the 12 danger signs, and assumed to have poor knowledge when they could identify (1−6) of the danger signs, and assumed to have good knowledge when they could identify (7−12) signs

Data collected through the structured interviews, was coded and entered into IBM SPSS Statistics software for

analysis version 26.0 (IBM Corp., Armonk, NY, USA). The analysis began with descriptive statistics to summarize the characteristics of the study population and key study variables. Measures such as frequencies, percentages, means, and standard deviations were used to describe socio-demographic information, knowledge of pregnancy danger signs, antenatal care utilization patterns, and sources of health information.

To assess the relationships between independent variables (such as age, education level, parity, and place of residence) and the dependent variable (level of knowledge on pregnancy danger signs), inferential statistics was employed. Specifically, chi-square tests was used to examine associations between categorical variables. A p-value of less than or equal to 0.05 was considered statistically significant, indicating that the observed associations were unlikely to have occurred by chance.

Ethical approval for the study was obtained from the College of Medicine of the University of Sulaimani on October 23rd, 2024. Additionally, permission to conduct the study was granted by the respective administrative authorities of the selected health facilities in Chamchamal District through an official letter numbered 2037 that was issued on February 3rd, 2025. Prior to data collection, all participants were informed about the purpose, procedures, benefits, and potential risks of the study. Participation was entirely voluntary, and informed consent was obtained from each respondent before commencing the interviews.

RESULTS

The study involved 355 women attending ANC services across six health centres. The highest number of participants were from Takiya (30.1%) and Charmo (29.6%), while the smallest proportion attended Shahid Hama Rash (1.7%).

In terms of age distribution, the largest age group was 20−24 years (32.4%), followed by 25−29 years (23.7%). Participants aged under 20 comprised 6.8%, and those aged 35 or older made up 21.1% of the sample.

Regarding educational attainment, 32.7% of the women had a university education, while only 5.6% were illiterate or could only read. Similarly, most husbands had university education (34.9%), while 5.9% had no formal education or were only able to read.

As for occupation, the vast majority of women were housewives (82.5%), with a small proportion being employed (11.8%) or students (5.6%) (Table 1).

The obstetric history of the participants is presented in Table 2. Regarding gravidity, more than one-third of the participants were primigravida (37.7%), while 46.8% had experienced 2−4 pregnancies, and 15.5% had five or more.

Table 1. Participants' socio-demographic information (*N* = 355)

Variable / Category	No.	Percent (%)
Health center		
Takiya	107	30.1
Charmo	105	29.6
Shahid Said Jawhar	60	16.9
Raparin	55	15.5
Mala Yasin	22	6.2
Shahid Hama Rash	6	1.7
Age (years)		
< 20	24	6.8
20−24	115	32.4
25−29	84	23.7
30−34	57	16.1
≥ 35	75	21.1
Women's education		
Illiterate or read	20	5.6
Primary	73	20.6
Intermediate	76	21.4
Secondary	70	19.7
University	116	32.7
Women's occupation		
Employed	42	11.8
Student	20	5.6
Housewife	293	82.5
Husband's education		
Illiterate or read	21	5.9
Primary	82	23.1
Intermediate	79	22.3
Secondary	49	13.8
University	124	34.9

In terms of parity, among the 221 women who had given birth before, 42.5% had delivered once, 45.2% had 2−3 births, and 12.2% had four or more. With respect to miscarriage history, 39.4% reported having had at least one, while 60.6% had never experienced a miscarriage or abortion. Ectopic pregnancy was reported by 2.3%, and 5.9% reported having experienced a stillbirth or neonatal death. It is important to note that there were 134 participants with missing data in the parity, abortion, ectopic pregnancy, and stillbirth/death categories, as these women were primigravida and had no previous pregnancy experience.

Among the 221 participants who were multigravida, the majority (71.0%) delivered at a government hospital, while 28.5% delivered in a private hospital, and only 0.5% delivered at home. Regarding the type of last delivery, 51.1% underwent a caesarean section, and 48.9% had a normal vaginal delivery. In terms of pregnancy complications, 28.5% of women reported experiencing at least one complication, while 71.5% had no complications. Most participants (97.3%) attended antenatal care during their last pregnancy, whereas only 2.7% did not. Notably, 90.9% began ANC visits in the second trimester, followed by 5.0% in the first trimester, and 1.4% in the third trimester. A small proportion (2.7%) had not attended ANC at all. Regarding the frequency of ANC at-

Table 2. Obstetric history of participants

Variable / Category	No.	Percent (%)
Gravidity (*n* = 355)		
1	134	37.7
2−4	166	46.8
≥ 5	55	15.5
Parity (*n* = 221)		
1	94	42.5
2−3	100	45.2
≥ 4	27	12.2
Miscarriage (*n* = 221)		
No	134	60.6
Yes	87	39.4
Ectopic pregnancy (*n* = 221)		
No	216	97.7
Yes	5	2.3
Stillbirth/Death (*n* = 221)		
No	208	94.1
Yes	13	5.9

Table 3. Obstetric characteristics of the previous pregnancy

Variable / Category	No.	Percent (%)
Last delivery place (*n* = 221)		
Government hospital	157	71.0
Private hospital	63	28.5
At home	1	0.5
Last delivery type (*n* = 221)		
Caesarean section	113	51.1
Normal vaginal delivery	108	48.9
Complication (*n* = 221)		
Yes	63	28.5
No	158	71.5
Last pregnancy ANC attendance (*n* = 221)		
Yes	215	97.3
No	6	2.7
First ANC visit—gestational age (*n* = 221)		
First trimester	11	5.0
Second trimester	201	90.9
Third trimester	3	1.4
Not attended	6	2.7
ANC visits—frequency (*n* = 221)		
0−2	23	10.4
3−5	148	67.0
6−8	50	22.6

ANC = antenatal care.

Figure 1. Sources of information regarding danger signs (*N* = 355).

pressure (74.9%). Moderate awareness was noted for severe abdominal pain (58%) and convulsions/fits (46.5%), while recognition was lower for signs such as high-grade fever (42%), profuse vaginal discharge (43.1%), and fast or difficult breathing (36.3%). The least recognized signs included severe headache with blurred vision (29.6%), swelling of the face, hands, and legs (29.9%), extreme weakness (32.4%), and persistent vomiting (22.3%).

Figure 2. Distribution of women's knowledge about the danger signs (*N* = 355).

tendance, 67% of the participants visited (3−5) times, 22.6% visited (6−8) times, and 10.4% visited (0−2) times (Table 3). Of the 355 participants, 73 (20.6%) had not heard of any pregnancy danger signs. Overall, the most frequently cited source of information was healthcare providers (31.0%), followed by media (26.2%) and family or friends (22.3%) (Figure 1). In terms of knowledge level, 173 participants (48.7%) demonstrated poor knowledge, 151 (42.5%) had good knowledge, and 31 (8.7%) had no knowledge.

The most recognized signs as presented in Figure 2 were vaginal bleeding (Antepartum Haemorrhage) (84.8%), reduced or absent fetal movement (79.7%), and high blood
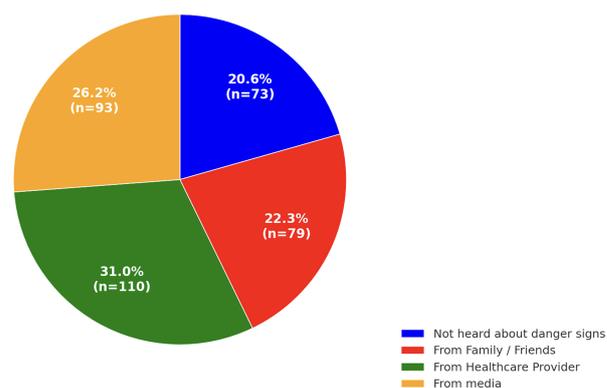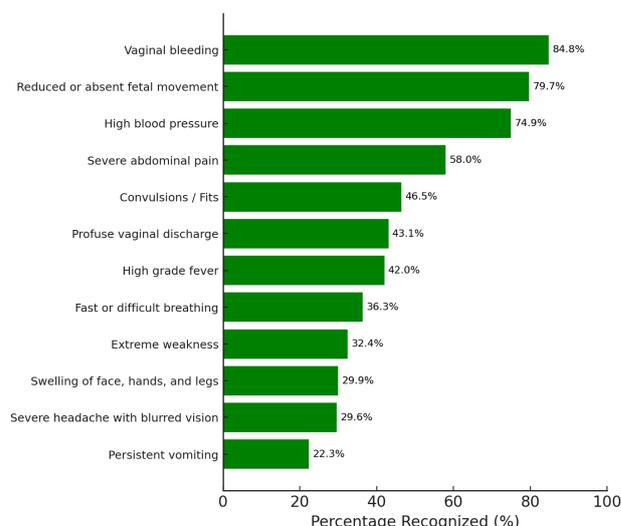
Table 4 explores the relationship between sociodemographic variables and women's knowledge of pregnancy danger signs. A statistically significant association was found between age and knowledge level (p = 0.007). Interestingly, the highest number of women with good knowledge were in the 20−24 age group (47 participants) and the 25−29 group (37 participants). No significant relationships were observed for women's education level (p = 0.191), husband's education level (p = 0.097), or occupation (p = 0.572).

Table 5 illustrates the relationship between selected obstetric history variables and women's knowledge of pregnancy danger signs. A statistically significant association was observed between gravidity and knowledge level (p =

Table 4. Relationship between sociodemographic characteristics and knowledge of danger signs

Variables		No	Poor	Good	Total	P value*
Age (years)	< 20	5 (1.4%)	15 (4.2%)	4 (1.1%)	24 (6.8%)	
	20−24	11 (3.1%)	57 (16.1%)	47 (13.2%)	115 (32.4%)	
	25−29	4 (1.1%)	43 (12.1%)	37 (10.4%)	84 (23.7%)	**0.007**
	30−34	0 (0.0%)	26 (7.3%)	31 (8.7%)	57 (16.1%)	
	≥ 35	11 (3.1%)	32 (9.0%)	32 (9.0%)	75 (21.1%)	
Women's education	Illiterate or read	5 (1.4%)	9 (2.5%)	6 (1.7%)	20 (5.6%)	
	Primary	6 (1.7%)	36 (10.1%)	31 (8.7%)	73 (20.6%)	
	Intermediate	9 (2.5%)	37 (10.4%)	30 (8.5%)	76 (21.4%)	0.191
	High school	6 (1.7%)	35 (9.9%)	29 (8.2%)	70 (19.7%)	
	University	5 (1.4%)	56 (15.8%)	55 (15.5%)	116 (32.7%)	
Husband's education	Illiterate or read	1 (0.3%)	13 (3.7%)	7 (2.0%)	27 (7.6%)	
	Primary	13 (3.7%)	35 (9.9%)	34 (9.6%)	82 (23.1%)	
	Intermediate	8 (2.3%)	37 (10.4%)	34 (9.6%)	79 (22.3%)	0.097
	High school	5 (1.4%)	27 (7.6%)	17 (4.8%)	49 (13.8%)	
	University	4 (1.1%)	61 (17.2%)	59 (16.6%)	124 (34.9%)	
Occupation	Employed	3 (0.8%)	17 (4.8%)	22 (6.2%)	42 (11.8%)	
	Housewife	27 (7.6%)	144 (40.6%)	122 (34.4%)	293 (82.5%)	0.572
	Student	1 (0.3%)	12 (3.4%)	7 (2.0%)	20 (5.6%)	

Percentages are of the total sample (*N* = 355). * Chi-square tests

Table 5. Relationship between obstetric history and knowledge of danger signs

Variables		No	Poor	Good	Total	P value*
Gravidity (*n* = 355)	1	13 (3.7%)	76 (21.4%)	45 (12.7%)	134 (37.7%)	
	2−4	14 (3.9%)	67 (18.9%)	85 (23.9%)	166 (46.8%)	**0.033**
	≥ 5	4 (1.1%)	30 (8.5%)	21 (5.9%)	55 (15.5%)	
Parity (*n* = 221)	1	7 (3.2%)	40 (18.1%)	47 (21.3%)	94 (42.5%)	
	2−3	8 (3.6%)	39 (17.6%)	53 (24.0%)	100 (45.2%)	0.076
	≥ 4	3 (1.4%)	18 (8.1%)	6 (2.7%)	27 (12.2%)	
ANC visits (*n* = 221)	0−2	0 (0.0%)	11 (5.0%)	12 (5.4%)	23 (10.4%)	
	3−5	14 (6.3%)	64 (29.0%)	70 (31.7%)	148 (67.0%)	0.666
	6−8	4 (1.8%)	22 (10.0%)	24 (10.9%)	50 (22.6%)	
Complications (*n* = 221)	Yes	5 (2.3%)	23 (10.4%)	35 (15.8%)	63 (28.5%)	
	No	13 (5.9%)	74 (33.5%)	71 (32.1%)	158 (71.5%)	0.054
Miscarriage (*n* = 221)	Yes	5 (2.3%)	32 (14.5%)	50 (22.6%)	87 (39.4%)	
	No	13 (5.9%)	65 (29.4%)	56 (25.3%)	134 (60.6%)	0.068

* Chi-square tests. ANC = antenatal care.

0.033), with women who had experienced 2−4 pregnancies demonstrating the highest proportion of good knowledge (n = 85), compared to those with only one pregnancy (n = 45). Although the relationships between parity (p = 0.076), miscarriage or abortion history (p = 0.068), and pregnancy complications (p = 0.054) were not statistically significant. No significant association was found between ANC visit frequency and knowledge level (p = 0.666), indicating that the number of ANC visits alone may not sufficiently enhance women's knowledge in this context.

DISCUSSION

Pregnancy is a natural process that brings about various physiological and psychological changes in women. However, even a normal pregnancy can be associated with specific issues and complications that may pose risks to the lives of both the mother and the fetus [10, 11].

Pregnancy danger signs are clinical warning symptoms of potential complications, and it is critical for women to be well educated about them [4].

Research has shown that recognizing the danger signs of pregnancy complications is a critical first step toward accepting timely and appropriate referrals for obstetric care [12, 13].

The present cross-sectional study assessed the knowledge of pregnancy danger signs among 355 women attending antenatal clinics in Chamchamal District in Iraqi Kurdistan. Chamchamal is characterized by a mix of urban and rural populations and is served by several public health centers that provide ANC services. The district was selected due to its demographic diversity and accessibility, offering a representative setting for investigating the knowledge levels of pregnant women in similar socio-geographic contexts. The reproductive profile was mixed: 37.7% were first-time mothers, 46.8%

had experienced two to four pregnancies, and 15.5% had five or more. Overall, 42.5% of women could recall seven or more danger signs, 48.7% could mention less than seven and 8.7% could not recall any. In contrast to the present study findings, a hospital-based study in Anbar Province reported that 80% of women knew two or more danger signs [14]. However, a recent study from Basrah was in agreement with the present results and reported that 44% of women had good knowledge of danger signs [15]. Such comparisons suggest that knowledge varies by locality and sampling, and that there is no universal benchmark. However, a common finding is that a substantial proportion of pregnant women remain unable to identify warning symptoms, which can delay care-seeking. In the current study, age emerged as a significant determinant of knowledge, while formal education and employment did not. Women aged 20 years and above, particularly those aged 25–34 years, were more likely to recall seven or more danger signs than teenagers, and age showed a statistically significant association with knowledge level. The finding is in good agreement with a study from Ethiopia, which reported that pregnant women aged 25–29 years and those older than 30 years were 3.35 to 8.11 times more likely to have better knowledge, respectively [16].

However, in that study, higher education and employment were associated with better knowledge of danger signs, which does not align with the present findings. Notably, 32.7% of the Chamchamal participants had university degrees, yet education was not associated with knowledge, paralleling findings from Riyadh where the level of education showed no significant relationship [17].

This suggests that general schooling does not necessarily convey maternal health information and underscores the need for dedicated health-education curricula. Employment status was also non-significant, perhaps because most participants were housewives and community campaigns reached both employed and unemployed women equally. The study findings showed that pregnancy experience mattered more: In the total sample, 23.9% were multigravida (2–4 pregnancies) with good knowledge, compared with 12.7% of primigravida women. This finding agrees well with a study conducted in Anbar [14], which reported higher knowledge levels among multigravida women (83.1%) compared with primigravida women (70.3%). Similarly, another study from Ethiopia found that gravidity was associated with knowledge level [18].

Repeated pregnancies may expose women to antenatal counselling, complications or shared experiences, reinforcing recognition of warning signs. By contrast, primigravidae may be overwhelmed by new information and less attuned to subtle symptoms, and women with very high parity may become complacent. Patterns of ANC attendance also provide insight. Nearly all multigravida women attended ANC in their last pregnancy, but more than 90% initiated care in the second

trimester. The WHO's 2016 guidelines recommend that the first contact occur within the first 12 weeks and that women have at least eight ANC contacts throughout pregnancy. Evidence suggests that increasing contacts from four to eight can reduce perinatal deaths by up to eight per 1000 births [19]. Late initiation in Chamchamal therefore represents a missed opportunity for early screening and counselling on danger signs. Moreover, the study found no significant association between the frequency of ANC visits and knowledge. This finding contrasts with other studies that have reported better knowledge of danger signs among women with more frequent ANC visits compared with those with fewer or no visits [16, 20].

Interestingly, the study findings regarding the association between experiencing complications during previous pregnancies and knowledge of danger signs were insignificant, and no association was found. The finding is in agreement with the findings of an Indian study, which similarly found that women who experienced complications had lesser knowledge [21].

The study also investigated the association between women's miscarriage history and their knowledge level of danger signs. 39.4% of the participants reported past miscarriage experiences; however, the finding was insignificant, and no association was found. In contrast to our study, in Upper Egypt, histories of miscarriage were linked to greater awareness of danger signs [22].

The pattern of recognition of specific danger signs in Chamchamal aligns with global trends. Vaginal bleeding (antepartum haemorrhage) was the most commonly mentioned sign, cited by 84.8 % of participants. Reduced or absent fetal movements (79.7 %) and high blood pressure (74.9 %) were also frequently identified. Similar findings were reported in Abha, Saudi Arabia, where severe vaginal bleeding, convulsions and decreased fetal movements were the most commonly recognised signs [23].

In Riyadh, however, in contrast with the current study awareness was far lower: only 29.9 % recognised severe vaginal bleeding, 45 % knew that swelling of the hands or face was dangerous and 39.5% were aware that blurred vision was worrisome [17]. These differences may reflect variations in education campaigns, the quality of antenatal counselling and cultural perceptions of illness. They also highlight a potential bias in hospital-based surveys, which may recruit women who already have better contact with health services. Nonetheless, the cross-country evidence confirms that bleeding and fetal distress are universally perceived as serious, offering an entry point for health-promotion messages.

Conversely, several danger signs were poorly recognised in Chamchamal, despite their clinical importance. Only 22.3% of women mentioned persistent vomiting, 29.6 % cited severe headache with blurred vision, 29.9 % recognised swelling of

the face, hands or legs and 32.4 % mentioned extreme weakness. These symptoms often herald hypertensive disorders, eclampsia or sepsis. Low awareness of such signs has been noted in other contexts: in the Saudi study, fewer than half of participants knew that swelling or blurred vision were danger signs [17]; in Anbar, blurred vision and convulsions were among the least recognised symptoms [14]. It is plausible that women underestimate the seriousness of headaches, visual changes or swelling because these symptoms can also occur in normal pregnancies. The strong emphasis on objective blood-pressure measurements—74.9% of participants knew that high blood pressure is dangerous—may further divert attention from subjective indicators such as headache, visual changes, swelling, or persistent vomiting. Education programmes should therefore stress that severe headaches, visual disturbances, swelling, fever and persistent vomiting are not benign; they may signal pre-eclampsia, severe anaemia or infection and require immediate medical evaluation. Culturally tailored messages that link these symptoms to stories or testimonies may improve recall and encourage timely help seeking.

Regarding the health-service utilisation,71% of multigravida women delivered their last baby in a government hospital and 28.5% in a private hospital, suggesting high institutional delivery coverage compared with other low-income settings. Only one woman delivered at home, reflecting successful promotion of facility births. However, the caesarean section rate was 51.1 %, far above the WHO's recommended range of 10−15 % a threshold beyond which additional CSs offer no reduction in maternal or neonatal mortality and may increase risks [24]. Globally, caesarean rates have risen from 7 % in 1990 to 21% in recent years [25], and the figure observed in Chamchamal suggests overuse. High CS rates may reflect provider preferences, maternal requests or perceptions that surgery is safer. Auditing indications and promoting evidence-based obstetric practice are therefore essential.

Sources of information influenced knowledge patterns but revealed gaps. About 20 % of women had never heard of obstetric danger signs. Among those who had, healthcare providers were the most common source, followed by media and social networks. The present findings align with those of a study from Riyadh, which found that visiting government hospitals was associated with better knowledge, whereas being unemployed decreased the odds of knowing any danger sign [17].

These findings suggest that the quality of care and counselling in facilities may be more influential than individual socio-economic status. At the same time, reliance on health workers means that women who do not attend ANC or live in remote areas may remain uninformed. Media campaigns, mobile health units and community health workers could complement facility-based counselling and ensure that messages reach a wider audience.

This study has limitations that temper the interpretation of its findings. Its cross-sectional design precludes causal inference; for example, it is unclear whether age or parity drive knowledge differences or are merely correlated with other factors. Data were collected in ANC clinics, so women who do not attend ANC, likely those with the least knowledge were not represented. Self-reported recall of danger signs may underestimate or overestimate true knowledge. Comparisons with other studies are complicated by differing definitions of "good" knowledge and varying lists of danger signs. Nevertheless, the study's strengths include a sizable sample drawn from multiple health centres and comprehensive assessment of socio-demographic and obstetric variables, permitting nuanced analysis.

CONCLUSION

The knowledge of pregnancy danger signs among women attending antenatal care in Chamchamal District was generally suboptimal. Most women recognised obvious signs such as vaginal bleeding and reduced fetal movements, but awareness of other signs—persistent vomiting, severe headaches with blurred vision, swelling, fever, or difficulty breathing—was limited. Age and gravidity were associated with knowledge, whereas education, occupation, and ANC visit frequency were not. These findings underscore the need for targeted health-education interventions, particularly for younger and first-time pregnant women, to improve recognition of danger signs and promote timely care seeking.

ETHICAL DECLARATIONS

· **Ethics Approval and Consent to Participate**

The College of Medicine, University of Sulaimani, approved the study on 23 October 2024, and additional permission was obtained from the administrative authorities of the participating health facilities in Chamchamal District (Letter No. 2037; 3 February 2025). All participants were informed about the study and voluntarily provided informed consent before data collection.

· **Consent for Publication**

None.

· **Availability of Data and Material**

The datasets are available from the corresponding author upon reasonable request.

- **Competing Interests**

  The authors declare that there is no conflict of interest.

- **Funding**

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- **Use of Generative Artificial Intelligence**

  The authors declare that no generative AI tools were used in the preparation, writing, or editing of this manuscript.

- **Authors' Contributions**

  All authors contributed to the literature review, study design, data collection, statistical analysis, and manuscript preparation. All authors have read and approved the final version of the manuscript.

REFERENCES

[1] Getachew D, Getachew T, Debella A, Eyeberu A, Atnafe G, Assefa N, Magnitude and determinants of knowledge towards pregnancy danger signs among pregnant women attending antenatal care at Chiro town health institutions, Ethiopia. *SAGE Open Medicine* 2022;10. https://doi.org/10.1177/20503121221075125

[2] Asferie WN, Goshu B, Knowledge of pregnancy danger signs and its associated factors among pregnant women in Debre Tabor Town Health Facilities, South Gondar Administrative Zone, North West Ethiopia, 2019: Cross-sectional study. *SAGE Open Medicine* 2022;10:20503121221074492. https://doi.org/10.1177/20503121221074492

[3] Bhavana BM, Yogesh M, Padhiyar NG, Damor N, Obstetric danger signs in context: A mixed methods study exploring knowledge and sociocultural factors among pregnant women. *Journal of Education and Health Promotion* 2024;13. https://doi.org/10.4103/jehp.jehp_315_24

[4] Solomon AA, Amanta A, Chirkose E, Badi MB, Knowledge about danger signs of pregnancy and associated factors among pregnant women in Debra Birhan Town, Central Ethiopia. *Science Journal of Public Health* 2015;3(2):269−73. https://doi.org/10.11648/j.sjph.20150302.27

[5] Kabakyenga JK, Östergren PO, Turyakira E, Pettersson KO, Knowledge of obstetric danger signs and birth preparedness practices among women in rural Uganda. *Reproductive health* 2011;8(1):33. https://doi.org/10.1186/1742-4755-8-33

[6] Hoque M, Hoque M, Knowledge of danger signs for major obstetric complications among pregnant KwaZulu-Natal women: implications for health education. *Asia Pacific Journal of Public Health* 2011;23(6):946−956. https://doi.org/10.1177/1010539511428698

[7] Kotrlik J, Higgins C, Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Information technology, learning, and performance journal* 2001;19(1):43.

[8] Noor S, Tajik O, Golzar J, Simple random sampling. *International Journal of Education & Language Studies* 2022;1(2):78−82. https://doi.org/10.22034/ijels.2022.162982

[9] Rashidi MN, Begum RA, Mokhtar M, Pereira J, The conduct of structured interviews as research implementation method. *Journal of Advanced Research Design* 2014;1(1):28−34.

[10] Liben ML, Wuneh AG, Zepro NB, Knowledge of pregnancy danger signs and associated factors among pastoral women in Afar Regional State, Ethiopia. *Cogent Medicine* 2019;6(1):1612133. https://doi.org/10.1080/2331205X.2019.1612133

[11] Bakar RR, Mmbaga BT, Nielsen BB, Manongi RN, Awareness of danger signs during pregnancy and post-delivery period among women of reproductive age in Unguja Island, Zanzibar: a qualitative study. *African journal of reproductive health* 2019;23(1):27−36. https://doi.org/10.4314/ajrh.v23i1

[12] Dunn A, Haque S, Innes M, Rural Kenyan men's awareness of danger signs of obstetric complications. *Pan African Medical Journal* 2011;10. https://doi.org/10.4314/pamj.v10i0

[13] Wassihun B, Negese B, Bedada H, Bekele S, Bante A, Yeheyis T, et al., Knowledge of obstetric danger signs and associated factors: a study among mothers in Shashamane town, Oromia region, Ethiopia. *Reproductive Health* 2020;17(1):4. https://doi.org/10.1186/s12978-020-0853-z

[14] Lami F, et al., Knowledge of Pregnant Women About Obstetric Danger Signs of Pregnancy: Experience of a Maternity Hospital in Iraq. *Acta Scientific Women's Health* 2024;6(1):7−13.

[15] Zahidi R, Almulla A, Knowledge of pregnancy danger signs and associated factors among pregnant women attending antenatal care services in Basra city. *The Medical Journal of Basrah University* 2022;40(2):134−142. https://doi.org/10.33762/mjbu.2023.140358.1126

[16] Gesese SS, Mersha EA, Balcha WF, Knowledge of danger signs of pregnancy and health-seeking action among pregnant women: a health facility-based cross-sectional study. *Annals of Medicine and Surgery* 2023;85(5):1722–1730. https://doi.org/10.1097/MS9.0000000000000610

[17] Abu-Shaheen A, Heena H, Nofal A, Riaz M, AlFayyad I, Knowledge of obstetric danger signs among Saudi Arabian women. *BMC Public Health* 2020;20(1):939. https://doi.org/10.1186/s12889-020-09075-9

[18] Koovimon P, Kaikaew K, Mahoree K, Bumphenki-atikul T, Knowledge of obstetric danger signs and associated factors among pregnant women attending antenatal care services at Thai community hospital. *F1000Research* 2023;12:851. https://doi.org/10.12688/f1000research.131267.2

[19] World Health Organization, WHO recommendations on antenatal care for a positive pregnancy experience 2016. https://iris.who.int/handle/10665/250796

[20] Nkencho O, Okeoghene E, Vincent A, Knowledge and Attitude of Pregnant Women towards Obstetric Danger Signs amongst Those Attending Antenatal Clinic in Yenagoa Metropolis, South-South, Nigeria. *International Journal of Women's Health and Wellness* 2022;8(2):139. https://doi.org/10.23937/2474-1353/1510139

[21] Ahmad D, Mohanty I, Hazra A, Niyonsenga T, The Knowledge of Danger Signs of Obstetric Complications among Women in Rural India: Evaluating an Integrated Microfinance and Health Literacy Program. *BMC Pregnancy and Childbirth* 2021;21(1):79. https://doi.org/10.1186/s12884-021-03563-5

[22] Ali R, Mohamed A, Arief A, Abdel-Salam D, Khalaf F, Effectiveness of Health Education Program on the Level of Knowledge and Attitude of Pregnant Women Regarding Obstetric Danger Signs in Upper Egypt. *Journal of High Institute of Public Health* 2020;50(3):118–125. https://doi.org/10.21608/jhiph.2020.111317

[23] Alshaikh AA, Assiri AS, Riaz F, Alshaikhi SA, Alarrafi AA, Bharti RK, et al., Factors Associated with the Knowledge of Obstetric Danger Signs among Pregnant Women Attending Primary Health Care Antenatal Care Clinics in Abha City. *Journal of Family Medicine and Primary Care* 2023;12(11):2855–2862. https://doi.org/10.4103/jfmpc.jfmpc_425_23

[24] Betran AP, Ye J, Moller A, Souza JP, Zhang J, Trends and projections of caesarean section rates: global and regional estimates. *BMJ Global Health* 2021;6:e005671. https://doi.org/10.1136/bmjgh-2021-005671

[25] Angolile CM, Max BL, Mushemba J, Mashauri HL, Global increased cesarean section rates and public health implications: a call to action. *Health Science Reports* 2023;6:e1274. https://doi.org/10.1002/hsr2.1274