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Research Article
Descriptive Study for Pregnant Women's Knowledge Attitude and Practices Regarding Iron Deficiency Anemia and Iron Supplements in the Southern Region of KSA

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Abstract

Background and Objective: Pregnancy with iron-deficiency anaemia can put the mother and the infant into a high-risk category, therefore, women need to be aware of the risks and preventive measures. The main objective of this study was to ascertain and measure women's knowledge, attitudes and practices related to iron deficiency anemia and iron supplements in comparison to their hemoglobin (Hb) blood level in the southern region of Saudi Arabia. **Material and Methods:** A descriptive cross sectional survey using a self-administered questionnaire and checking the last hemoglobin level reported in patient's file during the month of March, 2019 at the Armed Forces Hospital Southern Region Obstetrics and Gynaecology Clinics. Sample size of 342 pregnant women participated in the study. **Results:** The main study outcomes show that the prevalence of anaemia was 42.5% (mild 23.9, moderate 15.2 and severe 3.8) and the mean hemoglobin level was 11.4 g dL^{-1}. For this study, poor knowledge score was 95, 38% had a negative attitude score and 84% received poor practice scores. Half of the women reported that their main source of information were from family and friends. Only 16% of the women received their health information from a health provider. **Conclusion:** Health education during antenatal visits from health care providers needs to be personalized to each woman, along with a mass media campaign for awareness purposes in the region.

Key words: Iron deficiency anemia, pregnant women, Saudi Arabia, hemoglobin, knowledge, attitudes and practices

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Iron deficiency anemia(IDA) or low haemoglobin level in pregnant women is considered high risk for both mother and infant in that haemoglobin is responsible for carrying oxygen to all body cells so that normal functionality takes place. In pregnancy, the need for iron is increased rapidly due to the course of pregnancy. In fact, approximately 840-1210 mg of iron is required[1]. The World Health Organization[2] posits that when the need for iron is unfulfilled in pregnancy, women may face iron-deficiency anemia problems, which, based on the hemoglobin concentration in blood, is defined as:

- Mild: 11-9.9 g dL^{-1}
- Moderate: 9.9-7 g dL^{-1}
- Severe: 7.0 g dL^{-1} and less

WHO[3] estimated the worldwide prevalence of anemia during pregnancy was 41.8%, in which 95% was based in developing countries and among poor segments. Women with IDA often complain of fatigue, low energy level and low mental concentration, while the case of severe anemia can be associated with low birth weight and pre-term birth[4,5]. Even postpartum and lactation studies showed a strong association with depression, stress and low cognitive performance tests[6]. IDA was associated with several maternal consequences such as placental insufficiency, increased risks for postpartum haemorrhage, which was a leading cause of maternal mortality, high association with maternal cardiac failure and inability to perform physical activities[7]. Postpartum complications can range from decreased milk production to increased chances for postpartum depression[8].

Among the Arab Gulf countries, the prevalence of IDA among pregnant women ranged from 22.6-54.0%[9]. The only previous study found in the southern region of Saudi Arabia was in 1994 by Mahfouz *et al.*[10], which showed that the prevalence IDA among pregnant women was 31.9%. Other studies in Saudi Arabia reporting on IDA among pregnant women include Al Khobar at 41.3%[11] and Hail with a prevalence of 58%[12]. Another study on anemic women in the child-bearing age showed 37% in Riyadh[13] and 12.7% in Tabuk among university female students[14].

For pregnant women, dietary modification and changes in nutritional habits was highly recommended to increase iron absorption. Increasing iron-containing meals, adding iron absorption enhancers, such as ascorbic acid-rich food (e.g., citrus fruit) and eliminating iron absorption inhibitors, such as tea, was highly recommended[15,16]. Additional studies have shown that iron supplementation throughout pregnancy to maintain the level of Hb (11-12 g dL^{-1}) had a better outcome in pre-term birth and low birth weight[3,5,17,18]. Therefore, WHO[3] recommended a daily supplementation of oral iron and folic acid during pregnancy. Studies showed that national iron supplementation programs might not be the only variable to decrease IDA during pregnancy. Other such variables include women's knowledge regarding anemia complications, intake of iron-rich foods and understanding the importance of iron supplementation were found to be key factors for women's compliance for the program. Women found to be most at-risk for IDA were those with negative attitudes, poor practices and a lack of commitment to antenatal visits and follow-up during pregnancy[16]. Researchers also found sociodemographic, obstetric factors, education level and number of deliveries as additional variables for IDA in pregnant women[16].

The purpose of this study was to measure women's knowledge, attitudes and practices related to IDA and iron supplements compared to their hemoglobin (Hb) blood level in the southern region of Saudi Arabia.

MATERIAL AND METHODS

Study design
Descriptive cross-sectional study
Study tool: For assessing Hb level, the participants' last recorded lab result reading was accessed and used for the study. All women signed consent forms to grant permission to access of the respective medical file. Hb level was analyzed based on the WHO classified levels of anemia (mild: 11-9.9, moderate: 9.9-7, severe: <7 g dL^{-1})[3]. For assessing knowledge, attitudes and practices (KAP), self-administered questionnaires were distributed, which was developed based on an extensive literature review and adopted to consider cultural perspectives. The questionnaire consisted of 2 main parts: women's demographic variables (e.g., age, parity, level of education and employment status), the 2nd part was based on IDA and iron supplements, which was adopted from the standardized KAP on IDA and iron supplements from the Food and Agriculture Organization (FAO)[19]. The questions were translated to Arabic and, thereafter, a pilot study was conducted using 10% of the study sample.

The questionnaire consisted of 12 questions on knowledge, 11 of which were open-ended:

- **Question no. 1:** Write whatever information you know about iron deficiency anemia and the importance of iron to the body system?

Ideal answers contained information on low iron in the blood and transporting oxygen to the whole body for proper functioning, while analyzing responses on know or do not know.

- **Question no. 2:** What are the signs and symptoms of iron- deficiency anemia?

Ideal answers contained information regarding less energy, paleness, spoon nails/bent nails, more likely to become sick and less immunity to infection, while analyzing the number of correct answers or don't know responses.

- **Question no. 3:** What are the main reasons for iron- deficiency anemia?

Ideal answers included lack of iron in the diet related to eating too little/not enough, sickness/infection and heavy bleeding during menstruation, while analyzing the number of correct answers or don't know responses.

- **Question no. 4:** What are the consequences of iron-deficiency anemia in infants?

Ideal answers included delay of physical and mental development, low birth weight and premature delivery, while analyzing the number or correct answers or don't know responses.

- **Question no. 5 :** What are the consequences of iron-deficiency anemia in pregnant women?

Ideal answers included risk of dying during or after pregnancy, difficult delivery, bleeding and depression after delivery, while analyzing the number of correct answers or don't know responses.

- **Question no. 6:** How does one prevent anemia?

Ideal answers included eating iron-rich foods/having a diet rich in iron, eating vitamin C-rich food during or right after meals, taking iron supplements regularly when prescribed and treating infection immediately, while analyzing the number of correct answers or don't know responses.

- **Question no. 7:** List some iron-rich food that you know

Ideal answers included liver, kidney, mutton, beef, fish, chicken, spinach, sweet potato, kale, beet greens, soya beans,

lima beans, fortified breakfast cereals and whole-wheat flour, while analyzing the number of correct answers or don't know responses.

- **Question no. 8:** What are the foods that help in absorption of iron?

Ideal answers included oranges, lemons, bell peppers, guavas, strawberries or any food that contains vitamin C, while analyzing the number of correct answers or don't know responses.

- **Question no. 9:** What are the sorts of food that hinder iron absorption if taken during meals?

Ideal answers included milk, yogurt walnuts, lentils and eggs, while analyzing the number of correct answers or don't know responses.

- **Question no. 10:** What are the drinks that decrease iron absorption if taken during meals?

Ideal answers included coffee, tea or don't know, whereas all responses were considered in the data analysis.

- **Question no. 11:** Mention all last day meals that you consumed containing iron-rich food

Ideal answers were the number of correct answers or nothing. This question was analyzed in both knowledge and practice scores as when women recognize the food eaten containing iron that should be counted as knowledge and when women mention how many items of iron rich food eaten last day that should be counted as practice.

While question no. 12 was a direct multiple-choice: IDA increases with pregnancy? With multiple answers of (yes, no, don't know)

The total score of correct answers was calculated to be 44 points. The scoring system was used in a new variable: poor knowledge was <50%, satisfactory knowledge was between 50-65% and good knowledge was above 65%[20].

Five questions focused on attitude and each had 3 answers (i.e., agree, don't agree, don't know). Each item was scored as 3, 2 and 1, respectively. The item scores were summed up with a total score of 15, which was then converted into a percentage score, where a negative score was <60% and a positive score >60%)[20].

Seven multiple choice questions on practice were scored accordingly:

- Good practice-2 scores
- Poor practice -0 scores

With a total score of 14, all items were summed up and converted into percentage scores (i.e., good practice $\geq$50% and poor practice <50%)[21].

This study took place at the Obstetrics and Gynaecology (OB-GYN) clinic at the Armed Forces Hospital Southern Region since it provided reproductive health care, including antenatal care and high-risk pregnancy services to the entire southern region. The OB-GYN clinics were connected to the hospital ward of the same specialty. On average, about 370 patients were seen daily in the clinics.

Data collection: The data was collected daily in March, 2019 at different times throughout the business day. The questionnaires were distributed by simple random selection to pregnant women sitting in the waiting room. All women received an envelope with either questionnaire or a health education packet with in formation about breast feeding. Almost every other women sitting in the waiting area received the questionnaire.

Ethical consideration: Each willing to participate was asked to sign a consent form attached to the questionnaire. If a participant signed the consent form but later refused, she was counted in the non-response rate and asked to sign the refusal to participate form. The study was conducted following the approval of the Armed Forces Hospital Southern Region Research Ethical Committee.

Study sample: Sample size was determined by using single population proportion formula:

$$n = \frac{(z)^2\ p(1\text{-}p\ )}{day^2}$$

The prevalence of anemia among pregnant women, according to a previous study in the Asir region, located in southwest Saudi Arabia, was 31%[10] and took into consideration a 5% margin of error, 95% CI and a non-response rate of 10%. For this study, the sample size was 360 pregnant women. In data collection, 342 questionnaire were received with a response rate of 95%.

Statistical analysis: The PASW Statistics 18 software was used to enter and analyze the data. Cross tabulation and the Pearson Chi-square Test was used to compare proportions for variables.

RESULTS

Demographic and women's maternal characteristics: Among the study sample of 342 women, the majority ranged in age between 20 and 40-years-old, 35% were <20-years-old, nearly 43% were university degree holders of academic or administration study. However, only 11% were currently working. Almost all women perceived their social status as middle class. The first marriage of 1/3 of the women occurred less than 19 years of age (Table 1).

Close to half of the women had 4 or more previous pregnancies, 59% of women were in their 3rd trimester, half of the women had never used any family planning method, while close to 60% reported less than 2 years spacing between their children. Additionally, more than half of the women had least one abortion (Table 1).

Anemia and low hemoglobin level: Among the 342 women, 42.45% were anaemic, where 23.4% was mild anemia,15.2% was moderate anemia and 3.8% was severe anemia. The average hemoglobin level was 11 g dL^{-1} and the minimum level was 7 g dL^{-1} (Fig. 1).

Knowledge, attitude and practices towards IDA

Knowledge: Almost all women (95%) had a poor knowledge score regarding IDA definition, causes, signs and symptoms on both woman and infant, prevention, treatment, food rich in iron, food fast in iron absorption, foods that limit iron absorption and the drinks that limit iron absorption (Fig. 2). Among the participants, 35.7% could not recognize any of the signs and symptoms of IDA and only 9% knew the definition of IDA and the importance of iron to the body system. Nearly all the women did not know the consequences of IDA for pregnant women or the infant. Close to half of the women were able to identify one or two sources of iron-rich foods, of which the response was red meat. Regarding drinks that prevented iron absorption,1/3 of the women recorded the response as either tea, coffee or both. Two third of women were aware that the danger of IDA increases with pregnancy (Table 2). Only 16% of women reported that their source of information was from health care providers. Almost half of the women received health information from friends or family members (Table 3).

Attitudes: The result of attitudes show that about 38% of women had a negative attitudes score towards IDA (Fig. 3). About 37% of women were not sure that pregnancy increased

Table 1: Demographic and maternal characteristics of the studied women (n = 342)

Characteristics	Number	Percentage
Age		
15-20	12	3.5
21-25	70	20.5
26-30	98	28.7
31-40	69	20.2
>40	15	4.4
Mean±SD (Range)	30.75±6.132	17-46
Education level		
Never went to school	11	3.2
Primary schooling	33	9.6
Secondary Schooling	129	37.7
Diploma/professional training	16	4.7
University	146	42.7
Higher education	7	2.0
Educational specialty area (n = 169)		
Health profession	11	6.5
Administration	68	40.2
Academic	90	53.3
Working status		
Housewife	304	88.9
Employed	32	9.4
Managing small project	6	1.8
Financial status		
High	9	2.6
Middle	332	97.1
Low	1	0.3
Marriage years		
0-1	43	12.6
2-4	68	19.9
5-7	55	16.1
8-10	54	15.8
>10	122	35.7
Mean±SD (Range)	8.65±6.65	1-26
Age at first marriage		
13-19	123	36.0
20-25	152	44.4
>26	67	19.6
Mean±SD (Range)	21.71±4.55	13-37
Number of previous pregnancies (Gravida)		
0	52	15.2
1	40	11.7
2	55	16.1
3	46	13.5
≥4	149	43.6
Pregnancy trimester		
First	32	9.4
Second	108	31.4
Third	202	59.0
Have you ever used family planning methods (pills, IUD, Injections)		
Yes	164	48.0
No	177	51.8
Time span between pregnancies (n = 293)		
<2 years	173	59.2
>2 years	119	40.8
Mean±SD (Range)	1.41±0.51	1-4
Number of deliveries		
0	84	24.6
1	73	21.3
2	49	14.3
3	44	12.9
≥4	92	26.9

Table 1: Continue

Characteristics	Number	Percentage
Number of abortions		
0	147	43.0
1	102	29.8
2	53	15.5
3	28	8.2
>4	12	3.5

Table 2: Knowledge of participants regarding iron deficiency anemia (n = 342)

| Knowledge	Number	Percentage
Information woman knows about IDA and the importance of Iron to the body system		
Know	32	9.4
Don't know	310	90.6
IDA signs and symptoms (number of correct answers)		
0	122	35.7
1	65	19.0
2	119	34.0
3	30	8.8
4	6	1.8
IDA cause (number of correct answers)		
0	1	0.3
1	138	40.4
2	25	7.3
3	2	0.6
Don't know	176	51.5
Major consequences of IDA on pregnant woman		
Number of correct answers		
1	20	5.8
2	5	1.5
3	1	0.3
Don't know	316	92.1
Major consequences of IDA on infant		
Know	27	7.9
Don't know	315	92.1
IDA preventive measures		
Number of correct answers		
1	114	33.3
2	59	17.3
Don't know	169	49.4
Mentioned iron-rich food		
1-2	163	47.7
3-4	42	12.3
>4	4	1.2
Don't know	133	38.9
Mentioned food enhance iron absorption		
Know	63	18.4
Don't know	279	81.6
Mentioned food hinder Iron absorption		
1	20	5.8
2	10	2.9
3	4	1.2
Don't know	308	90.1
Drinks prevent iron absorption		
Tea	73	21.3
Coffee	2	0.6
Tea and coffee	48	14.0
Don't know	219	64.0
Danger of IDA increases with pregnancy		
Yes	255	74.6
No	2	0.6
Don't know	85	24.9
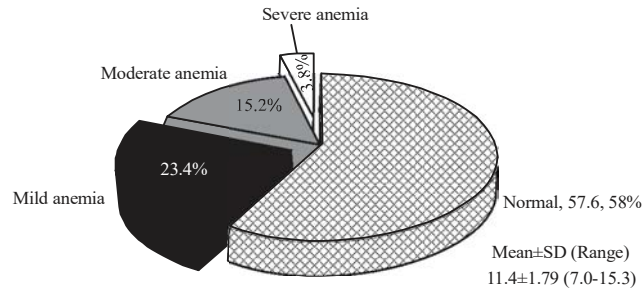
Fig. 1: Hemoglobin level of the women (n = 342)

Table 3: Sources of information regarding iron deficiency anemia (n = 297)

Sources	Number	Percentage
Family/friends	119	40.1
Health care providers (doctor, nurse, nutritionist...etc.)	48	16.2
Media YV, Radio, health education materials)	84	28.3
Social media (Facebook, line, what's up···)	46	15.5

Table 4: Women's attitudes regarding iron deficiency anemia (n= 342)

Responses	Number	Percentage
Regular antenatal checkup of blood tests are essential during pregnancy		
Yes	282	82.5
No	6	1.8
Don't know	54	15.8
Iron- deficiency anemia considered to be dangerous during pregnancy		
Yes	205	59.9
No	10	2.9
Not sure	127	37.1
It is essential to take special diet during pregnancy		
Yes	288	84.2
No	13	3.8
Don't know	41	12.0
Pregnant women should take Iron tablets in spite of healthy diet		
Yes	265	77.5
No	10	2.9
Don't know	67	19.6
Family planning and birth spacing can decrease iron deficiency anemia		
Yes	150	43.9
No	21	6.1
Don't know	171	50.0
Preparing Iron-rich diet can be difficult		
Yes	46	13.5
No	208	60.8
Don't know	88	25.7
Do you like iron rich diet		
Yes	246	71.9
No	22	6.4
Don't know	74	21.7

the risk of IDA and 25% did not know whether preparing iron-rich food was difficult or not. However, the majority of the women mentioned that antenatal care is important during pregnancy and 2/3 of them recorded that iron supplementation should be taken despite good diet. Eighty percent of the women like iron rich foods (Table 4).

Practice: The study revealed poor practice as only 16% of women received good practice scores (Fig. 4). Nearly 2/3 or 67% practiced their usual diets during pregnancy. Furthermore, 36% took iron supplement regularly, 77% took iron supplement after meals, 75% drank coffee or tea during pregnancy and 41% drank tea or coffee 2 h before or 2 h after meals (Table 5).

Table 5: Practices of participants regarding iron deficiency anemia (n = 342)

| Practices	Number	Percentage
How is your eating habits after becoming pregnant		
Taking the usual diet	230	67.3
Taking special diet	112	32.7
Are you taking iron supplements tablets during your current pregnancy		
Yes regular	126	36.8
Yes irregular	180	52.6
Not taking	36	10.5
Reason for not taking iron supplements/irregular taking (n = 220)		
Never been prescribed	24	11.1
Had lots of disturbances	78	36.1
No need as I eat well	12	5.6
Forgetfulness	102	47.2
When are you taking iron supplements (n = 306)		
After food	236	77.1
Before food	28	9.2
With food	19	6.2
First thing in the morning	23	7.5
Are you drinking coffee or tea during your current pregnancy		
Yes	257	75.1
No	85	24.9
At what time you take your coffee or tea		
Right after meal	21	6.1
With meal	15	4.4
2 hours before meal	25	7.3
2 hours after meal	116	33.9
Before and after meal	28	8.2
Before and after meals/at any time	52	15.2
I don't drink	85	24.6
Number of food eaten yesterday containing iron		
Nothing	225	65.8
1	87	25.4
2	30	8.8
Regular Hb monitoring during pregnancy		
Yes	155	45.3
No	61	17.8
Don't know follow clinic routine	126	36.8
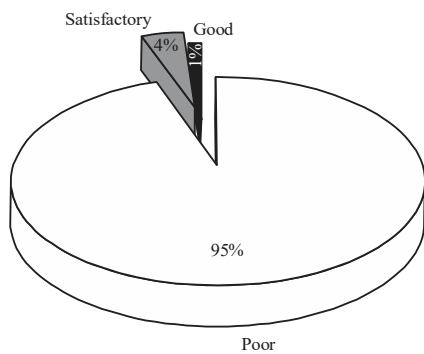
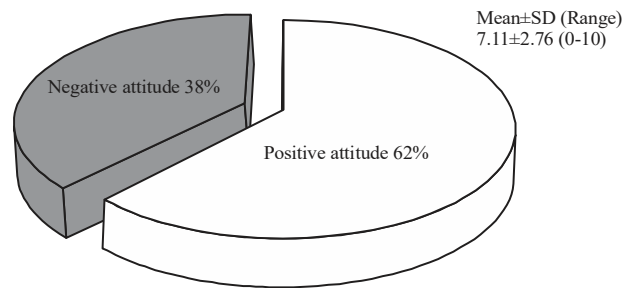Fig. 2: Total knowledge score among the studied women (n = 342) related to IDA

Fig. 3: Total Attitude scores among studied women towards IDA prevention (n = 342)

Factors associated with anemia: The study found age, level of education, age at first marriage, number of previous pregnancies, number of previous deliveries, number of previous abortions and average spacing time between pregnancies were not all significantly related to the anemic women in this study. Pregnancy trimester was highly significant (p = 0.000) as anemia increased as pregnancy progressed. Regular intake of iron supplements might also be

Table 6: Relationship between women's characteristics and iron deficiency anemia among studied pregnant women (n = 342)

Characteristics	Anemic 145 (42.4)	Normal 197 (57.6)	p-value >0.005*
Age			
15-20	5 (41.7)	7 (58.3)	0.832
21-25	30 (42.9)	40 (57.1)	
26-30	40 (40.8)	58 (59.2)	
31-35	34 (43.6)	44 (56.4)	
36-40	32 (46.4)	37 (53.6)	
>40	4 (26.7)	11 (73.3)	
Education			
Never went to school	6 (54.5)	5 (45.5)	0.628
Primary schooling	10 (30.3)	23 (69.7)	
Secondary schooling	57 (44.2)	72 (55.8)	
Diploma	7 (43.8)	9 (56.3)	
University	61 (41.8)	85 (58.2)	
Higher education	4 (57.1)	3 (42.9)	
Age at first marriage			
14-19	58 (47.2)	65 (52.8)	0.32
20-25	58 (38.2)	94 (61.8)	
>26	29 (43.3)	38 (56.7)	
Pregnancy trimester			
First	5 (15.6)	27 (84.4)	0.00
Second	30 (27.8)	78 (72.2)	
Third	110 (54.5)	92 (45.5)	
Number of previous pregnancies (Gravida)			
0	23 (44.2)	29 (55.8)	0.825
1	15 (37.5)	25 (62.5)	
2	25 (45.5)	30 (54.5)	
3	22 (47.8)	24 (52.2)	
$\geq$4	60 (40.3)	89 (59.7)	
Number of abortions			
0	64 (43.2)	84 (56.8)	0.965
1	43 (42.6)	58 (57.4)	
2	23 (43.4)	30 (56.6)	
3	10 (35.7)	18 (64.3)	
$\geq$4	5 (41.7)	7 (58.3)	
Number of deliveries			
0	36 (42.9)	48 (57.1)	0.992
1	31 (42.5)	42 (57.5)	
2	20 (40.8)	29 (59.2)	
3	20 (45.5)	24 (54.5)	
$\geq$4	38 (41.3)	54 (58.7)	
Average spacing time between pregnancies (n-292)			
2 years	72 (41.6)	101 (58.4)	0.464
<2 years	51 (42.9)	68 (57.1)	
Taking Iron supplements			
Yes regular	62 (49.2)	64 (50.8)	0.087
Yes irregular	72 (40.0)	108 (60.0)	
Not taking	11 (30.6)	25 (69.4)	

*p-value significant at p<0.005

significant as 50% of study participants who took regularly were not anemic (Table 6). There were no associations between knowledge, attitudes or practice scores with anemia and hemoglobin level (Fig. 5).

Relationship between knowledge, attitudes and practice scores with women's characteristics: Age showed no significant association with knowledge, attitude or practice scores. Level of education was significantly associated with knowledge scores (p = 0.003). As evident in the study, knowledge scores tended to increase among those with a higher level of education. Level of education was also highly significant with attitudes scores (p = 0.000) as those with higher levels of education tended to possess more positive
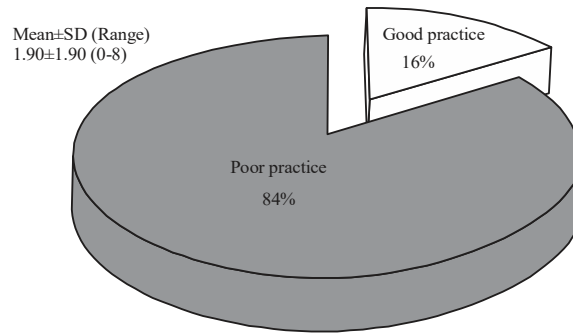
Mean±SD (Range)
1.90±1.90 (0-8)

Good practice
16%

Poor practice
84%

Fig. 4: Total practice scores among studied women regarding Iron deficiency anemia (n = 342)

Women's total scores in knowledge, attitudes and practices compaired to anemic status
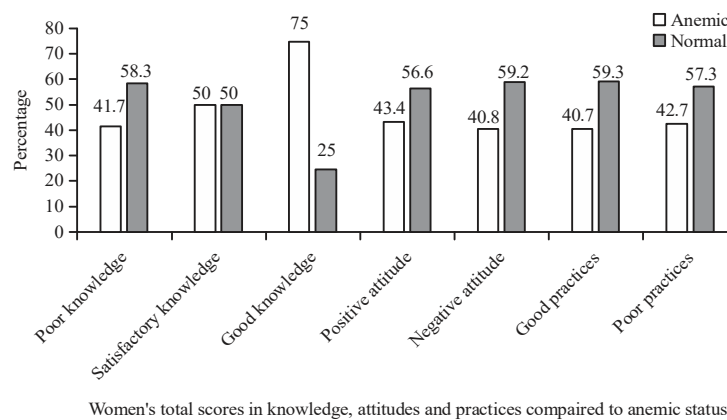
Fig. 5: Relationship between knowledge, attitudes, practices with anemia

attitudes, however, it was not significantly associated with women's practices (p = 0.175). Working status was significantly associated with positive attitudes (p = 0.031) but not with knowledge practice scores (Table 7).

DISCUSSION

Health-related behaviours can be modified or changed by influencing three major, continues and effective process as without basic knowledge, thinking of health needs and prevention can be challenging. Changing beliefs and developing new attitudes towards certain heath prevention efforts will further the health behaviour changes that are aligned and described by Liu *et al.*[22] in the knowledge-attitudes-behaviour model.

This study aimed to assess women's level of hemoglobin compared to their knowledge, attitudes and practices regarding IDA causes, consequences and prevention. The results of this study revealed that among the 342 women from the southern region of Saudi Arabia, the prevalence of anemia was 42.4% and the mean hemoglobin level was

11.4 g dL^{-1}, which was close to what was found in the Hail study (11.2 g dL^{-1}), analyzed as below normal[12]. The prevalence found in the current study was a little higher than what was found in the Mecca study (39%)[23].

In terms of regional countries, a comparative study conducted in 2015 between Egypt and Yemen found the prevalence of IDA among Yemeni women was 32.9% in comparison to 52.5% in Egypt[24]. While in Oman the prevalence of IDA in pregnant women ranged from 35.9-61% depending on the region[25], a study in Jordan found 27.4% among the same population[26]. Other previous studies indicated several influencing factors for IDA during pregnancy, including level of mother's education and social status[27-29], number of previous abortions[30], number of previous deliveries[28], number of previous pregnancies and lack of birth spacing[31,32]. These factors were not significantly related to anemia in this study. However, higher gestational age was highly significant with anemia in our results, which was similar to the study in Khobar[11] and others[28,29,33].

A study in Makkah also found that high gestation age was significantly related with anemia, birth spacing and low level

Table 7: Relation between knowledge, attitudes and practice scores with participant's characteristics

Women's characteristics	Knowledge score				Attitude score			Practice score		
	Poor 324 (94.7%)	Satisfactory 14 (4.1)	Good 4 (1.2)	p-value	Positive attitudes 212 (62.0%)	Negative attitudes 130 (38.0)	p-value	Good practice 54 (15.8)	Poor practice 288 (84.4)	p-value
Age										
15-20	12 (100.0)	0 (0.0)	0 (0.0)	0.122	8 (66.7)	4 (33.3)	0.995	2 (16.7)	10 (83.3)	0.254
21-25	68 (97.1)	2 (2.9)	0 (0.0)		44 (62.9)	26 (37.1)		14 (20.0)	56 (80.0)	
26-30	94 (95.9)	3 (3.1)	1 (1.0)		60 (61.2)	38 (38.8)		13 (13.3)	85 (86.7)	
31-35	73 (93.6)	2 (2.6)	3 (3.8)		47 (60.3)	31 (39.7)		13 (16.7)	65 (83.3)	
36-40	62 (89.9)	7 (10.1)	0 (0.0)		43 (62.3)	26 (37.7)		7 (10.1)	62 (89.9)	
>40	15 (100.0)	0 (0.0)	0 (0.0)		10 (66.7)	5 (33.3)		5 (33.3)	10 (66.7)	
Education										
Never went to school	11 (100.0)	0 (0.0)	0 (0.0)	0.003	7/(63.6)	7 (63.6)	0.000	0 (0.0)	11 (100.0)	0.175
Primary schooling	33 (100.0)	0 (0.0)	0 (0.0)		17 (51.5)	16 (48.5)		5 (15.2)	28 (84.8)	
Secondary schooling	162 (97.7)	1 (0.8)	2 (1.6)		66 (51.5)	63 (48.8)		21 (16.3)	108 (83.7)	
Diploma	13 (81.3)	3 (18.8)	0 (0.0)		13 (81.3)	3 (18.8)		0 (0.0)	16 (100.0)	
University	136 (93.2)	8 (5.5)	2 (1.4)		109 (74.7)	37 (25.3)		28 (19.2)	118 (80.8)	
Higher education	5 (71.4)	2 (28.5)	0 (0.0)		3 (42.9)	4 (57.1)		0 (0.0)	7 (100.0)	
Working status										
Housewife	291 (95.7)	10 (3.3)	3 (1.0)	0.097	181 (59.5)	123 (40.5)	0.031	50 (16.4)	254 (83.6)	0.579
Employed	27 (84.4)	4 (12.5)	1 (3.1)		26 (81.3)	6 (18.8)		3 (9.4)	29 (90.6)	
Managing project	6 (100.0)	0 (0.0)	0 (0.0)		5 (83.3)	1 (16.7)		1 (16.7)	5 (83.3)	

of education [23]. The current study revealed that a woman's level of education was highly correlated with knowledge about IDA as well as with overall positive attitudes. This factor was also found in a study in Ethiopia[23].

The current study suggests that women had poor knowledge about IDA despite the fact that close to half had university-level education. Level of health education and formal education were highly correlated with health outcomes in several pervious health-related studies[34]. However, the OECD Skills Outlook[34] highlighted that people from different educational backgrounds, other than health-related specialities, might struggle in understanding medical terminologies, health concepts and the link between social and lifestyle factors regarding health. Level of education can also influence health decisions. In addition Coreil[35], who found that preventive measures and healthy lifestyle decisions can be better achieved in terms of one's beliefs and attitudes, which can eventually lead to behavioural changes.

It was expected that when good health decisions were made and positive attitudes achieved, results would reflect such changes as evident in several studies on KAP related to IDA[16,20]. However, the current study showed that neither level of knowledge nor positive attitudes were correlated with level of anemia among pregnant women, women's practices or level of education. This would suggest that women's behaviour and health-related practices regarding IDA prevention among women in the southern region were highly influenced by cultural and social behaviours. One tenth of study participants who experienced a moderate to severe level of anemia received their information from a heath care provider. Therefore, the participants information and level of knowledge was poor. Women in the southern region were highly influenced by cultural and social factors related to health behaviours, which was also recognized in other studies[36,37].

Almurshed et al.[38] and Nigenda et al.[39] and others found in their studied among Saudi Women that pregnancy is considered a social and family concern rather than a women's health concern. As in the southern region, each member of the extended family has influence on women's decisions regarding caring for her infant and herself during the course of pregnancy. In addition, women in Saudi Arabia feel more comfortable discussing their health matters and concerns with their family and friends rather than with health care providers. One study in Riyadh assessing women's satisfaction with health education during antenatal care found that 66% of women received their health information from family or friends[40]. This study found that only 16% of the participants received health information from health care providers.

Health care providers perceive several barriers for providing health education in Saudi Arabia, such as language barriers, social and cultural beliefs and time pressure. As a result, printable materials tend to be a better choice for health education rather than counselling each woman as what was found in a study conducted by Altamimi *et al.*[41]. However, during the data collection process, it was discovered that study participants did not read any printed materials but rather left them behind or demonstrated no interest in the materials.

CONCLUSION

Similar to the women of Tabuk region, women in the southern region demonstrated a low level of knowledge and poor practice regarding IDA. Proper health education needs to be emphasised during antenatal visits as well as developing a mass media campaign targeting the region and probably further comparative studies in other regions needs to be conducted so as to influence the health related policy of anemia prevention and targeting pregnant women at the national level. Further nutritional studies should be conducted assessing women's nutritional practices during pregnancy.

SIGNIFICANCE STATEMENT

This study discovers that about 42.2% of pregnant women in the southern region are anemic, despite the fact that the majority of women were educated with higher education level, their level of knowledge regarding anemia prevention was very poor which also reflected on their prevention practices as well. This information can be beneficial for public health policy makers and women's health studies as it can help developing certain strategies to enhance women's antenatal care as well as national programs highlights the importance of IDA prevention and treatment over along the reproductive age for women. Social and cultural perspectives of care during pregnancy need to be further explored based on this study results so as to highlight the importance of the social and cultural context as well.

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