Knowledge and its associated factors on deficiency anaemia among pregnant mothers attending antenatal clinics in selected medical officer of health areas in Colombo district

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Abstract

Introduction: Anaemia is a common haematological disease in pregnancy. Positive interventions to improve maternal knowledge on deficiency anaemia and its preventive strategies will help to bridge the knowledge and practice gap.
Objective: To determine the knowledge and its associated factors on deficiency anaemia among pregnant mothers attending antenatal clinics in selected MOH areas in Colombo district.

Methods: A descriptive cross-sectional study was conducted using a validated, pre-tested interviewer administered questionnaire among 180 antenatal clinic attendees in two selected MOH areas in Colombo district selected through systematic sampling. The level of knowledge measured using a 15-item questionnaire (possible minimum score=0, maximum score=100) later dichotomized into 'Good' and 'Poor' based on the mean of the pilot study (=39). Factors associated with level of knowledge were analysed by Chi square test. Level of significance was considered as $p<0.05$.

Results: Majority (52.2%, n=94) had good knowledge towards deficiency anaemia. Iron deficiency anaemia was the most known form of deficiency anaemia 95.1% (n=155) followed by folate deficiency (38.0%, n=62). However, 68.7% (n=112) and 72.4%, (n=118) erroneously identified vitamin C and calcium deficiency as causes of anaemia, respectively. Monthly family income ($X2 = 6.714$, df= 1, p= 0.010) and highest level of education ($X2 = 9.376$, df= 3, p= 0.025) were significantly associated with the 'Good' level of knowledge.

Conclusions: Majority had good knowledge towards deficiency anaemia. Knowledge on iron deficiency anaemia was satisfactory. Knowledge on folate and vitamin B12 was poor. There were statistically significant associations between level of knowledge and highest level of education and monthly family income.

Introduction

Anaemia is one of the most prevailing haematological diseases associated with pregnancy. It is a medical condition in which there is a reduction in haemoglobin concentration. Inadequate intake, increased losses, increased demand, and sparse utilization of haemopoietic nutrients are the underlying causes of nutritional deficiency anaemia. Iron deficiency anaemia, which presents with hypochromic, microcytic erythrocytes on a peripheral blood smear, accounts for approximately 75% of all anaemias detected during pregnancy. Megaloblastic anaemia of pregnancy which is caused mostly by folic acid insufficiency and, to a lesser extent, by vitamin B12 deficiency, accounts for a large number of the remaining cases diagnosed among expectant mothers. Anaemia caused by a deficiency of other vitamins are extremely uncommon in humans. (1) When it comes to wealthy countries, nutritional deficiency anaemia is not a widespread problem. On the contrary, it is unquestionably a major public health issue in developing countries. The anaemic population of the developing world includes pregnant mothers, menstruating women, and children. (2)

Anaemia in pregnancy has been a long prevailing, prime maternal morbidity condition in Sri Lanka.(3) According to the most recent WHO data, anaemia during pregnancy affects 29.3% of Sri Lankan women.(4)

We believe positive interventions to improve maternal knowledge on deficiency anaemia and its preventive strategies will help to bridge the knowledge and practice gap and thereby improve better practice towards prevention strategies. Therefore, this study aimed at assessing pregnant mothers' knowledge and its associated factors on deficiency anaemia.

Methodology

A descriptive cross-sectional study, based on knowledge of deficiency anaemia and importance of adhering to preventive practices, was carried out to collect data from pregnant women attending antenatal clinics in selected MOH areas in Colombo district. The study was conducted in MOH areas Piliyandala and Boralesgamuwa. Data collection period stretched from May 2022 to July 2022. Pregnant women who were severely ill, suffering from mental impairments and not conversing in Sinhala/English languages were excluded.

With a non-response rate of 30% final sample size was calculated as 180. A systematic random sampling technique at a skip interval of every third was conducted to collect data for the study. An interviewer administered questionnaire comprising of close ended questions based on deficiency anaemia were implemented using face to face interview

technique. This study instrument comprised of 4 sections as follows.

Section 1 – Socio-demographic Factors
Section 2 - Sources of Knowledge
Section 3 - Knowledge on Deficiency Anaemia
Section 4 – Knowledge on Preventive Practices

The section 3 and section 4 comprise MCQ questions comprising both correct and incorrect statements based on causes, signs and symptoms, risk factors, nutritional knowledge on iron, folate, vitamin B12 and preventive practices etc. These section 3 and 4 were used to assess the level of knowledge on deficiency anaemia among the participants using a scoring system. The questionnaire started with inquiring whether the participant had heard of the word "deficiency anaemia" previously. Subsequent questions in the questionnaire were only continued with the respondents who had heard about the word "deficiency anaemia" (n=163, 90.6%) while the rest was excluded. The Prior to proper data collection, the questionnaire was pretested among 30 pregnant mothers in Embilipitiya MOH area to assess the flow of questions and the feasibility of the study. Each individual who chose the correct statements out of the given statements under each question in section 3 and 4 was rewarded with a mark. The maximum mark that an individual could score was 100 and the minimum mark was 0. No negative mark was given for choosing any of the given wrong statements. The level of knowledge was assessed using the mean knowledge of the study population of the pilot study (sample size=30), which was 38.9 and the median is 40, while the mode was 0. The level of knowledge of the study population was divided into two classes with regard to the rounded value of the above mean knowledge, as follows.

Good knowledge > 39
Poor knowledge ≤ 39

The collected data was analysed using the version 25.0 of Statistical Package for Social Sciences Software (SPSS). Frequency tables were used to review the descriptive data and Chi Square test and Fisher's exact test were operated to determine the association between level of knowledge and its associated factors.
Ethical clearance for the study was obtained from the Ethics Review Committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura.

Results

A total of 180 pregnant mothers participated with a 100% response rate. Majority of the study population was in the age group 25-29 years 9n=63, 35.0%) and Sinhalese (n=169, 93.9%). Socio-demographics and other characteristics of the study population is given in table 1.

Table 1: **Distribution of the study population according to socio-demographic and other factors**

	Frequency (n)	***Percentage (%)***
Age in years		
< 20	5	2.8
20-24	27	15.0
25-29	63	35.0
30-34	53	29.4
35-39	23	12.8
≥ 40	9	5.0
Total	180	100.0
Ethnicity		
Sinhala	169	93.9
Tamil	2	1.1
Muslim	6	3.3
Other	3	1.7
Total	180	100.0

Marital Status		
Unmarried	1	.6
Married	179	99.4
Divorced	0	0.0
Separated	0	0.0
Widowed	0	0.0
Total	180	100.0
Family Type		
Nuclear Family	81	45.0
Extended Family	99	55.0
Total	180	100.0
Highest Level of Education		
Below G.C.E. O/L	9	5.0
Up to G.C.E. O/L	52	28.9
Up to G.C.E. A/L	65	36.1
Certificate/Degree/Diploma	54	30.0
Total	180	100.0
Employment Status		
Employed	81	45.0
Unemployed	99	55.0
Total	180	100.0
Monthly Income of the Family		
<24, 999	1	.6
25, 000 – 49, 999	31	17.2
50,000-74,999	64	35.6
75,000-99,999	48	26.7
100, 000- 199, 999	33	18.3
≥200,000	3	1.7
Total	180	100.0
Gravidity		
1	83	46.1
2-4	96	53.3
≥5	1	.6
Total	180	100.0
Parity		
0	89	49.4
1	54	30.0
2-4	37	20.6
≥5	0	0.0
Total	180	100.0

No. of weeks of pregnancy at the time of data collection		
0-13 weeks	26	14.4
14-27 weeks	88	48.9
28-42 weeks	66	36.7
Total	180	100.0
Average birth spacing between successive pregnancies in years.		
≤1	7	8.2
2-4	66	67.3
5-7	23	23.5
≥8	1	1.0
Total	97b	100.0
Dietary Pattern		
Vegetarian	4	2.2
Not vegetarian	176	97.8
Total	180	100.0
Sources utilized to acquire knowledge on deficiency anaemia		
Physician	36	22.1
Nurse/Midwife	55	33.7
Family	3	1.8
Books/Handouts	19	11.7
Mass media	10	6.1
Social media	11	6.7
MOH clinic	29	17.8
Total	163	100.0
No. of times the participant has attended the clinic / No. of total required times of visits to the MOH clinic (as a percentage)		
≤25%	0	0.0
26-50%	2	1.1
51-75%	20	11.1
76%-100%	158	87.8
Total	180	100.0

a= The question was asked only from the study subjects who has heard about deficiency anaemia during pregnancy.
b= Mothers who were pregnant for the first time were excluded.

Majority of the population (90.6%, n= 163) had heard of the word deficiency anaemia. The frequencies of the participants who correctly identified the types of deficiency anaemias given in the table 2. In addition, to correct types, two incorrect statements were also included to mislead the respondents.

To assess the knowledge towards the definition and primary test used for diagnosis of anaemia, the responses were arranged from the most accurate definition to the least accurate definition and marks were given accordingly. The allocated marks for each statement are mentioned within brackets in the Table 3.

Table 2: **Distribution of knowledge towards the types of deficiency anaemia during pregnancy**

	Correct		**Incorrect**	
Types of deficiency anaemia	***Frequency (n)***	***Percentage (%)***	***Frequency (n)***	***Percentage (%)***
Iron deficiency anaemia (correct)	155	95.1	8	4.9
Vitamin C deficiency (incorrect)	112	68.7	51	31.3
Folate deficiency anaemia (correct)	62	38.0	101	61.9
Vitamin B12 deficiency anaemia(correct)	17	10.4	146	89.5
Calcium deficiency anaemia (incorrect)	118	72.4	45	27.6

Table 3: **Distribution of knowledge towards the definition and primary test used for diagnosis of anaemia**

Defined anaemia as	**Frequency (n)**	**Percentage (%)**
Low Hb level (5)	99	60.7
Reduced blood volume (4)	31	19.0
Pale colour of the body (2)	6	3.7
Poor nutrition (2)	19	11.7
Don't know (0)	8	4.9
Total	163	100.0
Identified primary test used for the diagnosis of anaemia		
Full Blood Count (4)	76	46.6
A blood test (2)	55	33.7
Don't know (0)	32	19.6
Total	163	100.0

Only 60.7% (n= 99) knew the correct definition of anaemia, while 4.9% (n= 8) didn't know the definition of it. Only n=76 (46.6%) knew that the full blood count was the test to diagnose anaemia.

Frequencies of correctly identifying signs and symptoms, causes, complications and risk factors, preventive nutritional practices and other prophylactic practices towards iron deficiency anaemia during pregnancy are given in table 4.

Table 4: **Distribution of knowledge towards deficiency anaemia and preventive practices during pregnancy**

	Correct		Incorrect	
Signs and symptoms of deficiency anaemia	**Frequency (n)**	**Percentage (%)**	**Frequency (n)**	**Percentage (%)**
Tiredness & dizziness (correct)	138	84.7	25	15.3
Weight gain (incorrect)	122	74.8	41	25.2
Headache (correct)	55	33.7	108	66.3
Sore throat (incorrect)	125	76.7	38	23.3
Pale colour of the body (correct)	93	57.1	70	42.9
Appearance of red spots on skin (incorrect)	120	73.6	43	26.4
Increased thirst (incorrect)	122	74.8	41	25.2
Pale colour of the nails & tongue (correct)	34	20.9	129	79.1
Increased Urination (incorrect)	120	73.6	43	26.4
Shortness of breath (correct)	25	15.3	138	84.7
Causative factors of deficiency anaemia				
Increased intake of fatty foods (incorrect)	120	73.6	43	26.4
Inadequate food intake (correct)	93	57.1	70	42.9
Imbalance diet (correct)	138	84.7	25	15.3
Not drinking adequate amount of water (incorrect)	109	66.9	54	33.1
Worm infection (correct)	27	16.6	136	83.4
Consumption of high amount of salt (incorrect)	123	75.5	40	24.5
Heavy blood loss (correct)	54	33.1	109	66.9
Heredity (correct)	34	20.9	129	79.1
Complications of deficiency anaemia during pregnancy				
Low birth weight (correct)	125	76.7	38	23.3
Premature delivery (correct)	83	50.9	80	49.1
High cholesterol level in blood (incorrect)	123	75.5	40	24.5
Postpartum anaemia (correct)	49	30.1	114	69.9
Kidney diseases (incorrect)	126	77.3	37	22.7
Abortions (correct)	66	40.5	97	59.5
Liver problems (incorrect)	122	74.8	41	25.2
Maternal death (correct)	46	28.2	117	71.8

Risk factors for deficiency anaemia during pregnancy				
Age of the mother higher than 35 years (correct)	73	44.8	90	55.2
High cholesterol level (incorrect)	116	71.1	47	28.8
Increased parity (correct)	76	46.6	87	53.4
Poor birth spacing (correct)	40	24.5	123	75.5
Goitre (correct)	8	4.9	155	95.1
The most effective ways of prevention of deficiency anaemia during pregnancy				
Having a balanced diet during pregnancy (correct)	156	95.7	7	4.3
Drinking more water (incorrect)	95	58.3	68	41.7
Use of prophylaxis prescribed by the physician (correct)	120	73.6	43	26.4
Treating worm infections (correct)	33	20.2	130	79.8
Reducing intake of fatty foods (incorrect)	116	71.2	47	28.8
Using iodized salt (incorrect)	115	70.6	48	29.4
Keeping more than 2 years of birth space betwe consecutive pregnancies (correct)	48	29.4	115	70.6
Food items rich in iron				
Dark green leafy vegetables (spinach, Centella, etc.) (correct)	144	88.3	19	11.7
Yoghurt, Milk (incorrect)	107	65.6	56	34.4
White meat (chicken, turkey) (correct)	44	27.0	119	73.0
Dried fruits (Dates, apricot) (correct)	6	3.7	157	96.3
Cereals (lentils, Mung beans etc.) (correct)	50	30.7	113	69.3
Sea food (correct)	68	41.7	95	58.3
Poultry (correct)	43	26.4	120	73.6
Red meat (Pork, Beef, mutton) (correct)	86	52.8	77	47.2
Food items rich in Vitamin B12				
Beef, liver, and chicken (correct)	57	35.0	106	65.0
Fish and shellfish such as salmon, tuna fish (correct)	27	16.6	136	83.4
Milk, yogurt, and dairy products (correct)	40	24.5	123	75.5
Banana (incorrect)	106	65.0	57	35.0
Watermelon (incorrect)	116	71.2	47	28.8
Cheese (correct)	34	20.9	129	79.1
Eggs (correct)	60	36.8	103	63.2
Green leafy vegetables (incorrect)	106	65.0	57	35.0

Food items rich in Folate				
Leafy green vegetables, such as spinach (correct)	48	29.4	115	70.6
Citrus fruits, such as orange juice (correct)	36	22.1	127	77.9
Beans, peas and nuts (correct)	48	29.4	115	70.6
Whole grains (correct)	62	38.0	101	62.0
Liver (correct)	33	20.2	130	79.8
Milk (incorrect)	106	65.0	57	35.0
Pork, beef, ham (incorrect)	93	57.1	70	42.9
Food items to be avoided after an iron containing meal				
Coffee (correct)	136	83.4	27	16.6
Tea (correct)	117	71.8	46	28.2
Chocolate (correct)	39	23.9	124	76.1
Raw eggs (incorrect)	110	67.5	53	32.5
Foods that contain tannins, such as grapes, corn, and sorghum (correct)	23	14.1	140	85.9
Foods that contain phytates, such as brown rice and whole-grain wheat products (correct)	22	13.5	141	86.5
Food practices that enhance iron absorption				
Adding extra lime to gotukola (Centella) sambal (correct)	113	69.3	50	30.7
Adding salt to meat (incorrect)	123	75.5	40	24.5
Refrain from coffee or tea after a main meal (correct)	82	50.3	81	49.7
Having more citrus fruits (correct)	70	42.9	93	57.1
Eating raw fish (incorrect)	125	76.7	38	23.3
Consuming more green vegetables (correct)	72	44.2	91	55.8
Preventive treatment methods for deficiency anaemia during pregnancy				
Iron sulphate (correct)	118	72.4	45	27.6
Folic acid (correct)	92	56.4	71	43.6
B12 supplements (correct)	41	25.2	122	74.8
Start iron supplementation after 30 weeks of gestation (incorrect)	124	76.1	39	23.9
Continuation of iron supplements for 6 months after delivery (correct)	31	19.0	132	81.0
Taking iron supplements with antacids (incorrect)	100	61.3	63	38.7

Table 5: **Association between the level of knowledge and socio-demographic factors of the study population**

		Poor Knowledge		Good Knowledge		Total		Significance
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Age in years	***< 30***	40	42.1%	55	57.9%	95	100.0%	X^2 = .082 df = 1 p = 0.774
	≥ 30	34	40.0%	51	60.0%	85	100.0%	
Ethnicity	***Sinhala***	72	42.6%	97	57.4%	169	100.0%	df = 1 p = 0.128[c]
	Other	2	18.2%	9	81.8%	11	100.0%	
Marital Status	***Unmarried***	0	0.0%	1	100.0%	1	100.0%	df = 1 p = 1.000[c]
	Married	74	41.3%	105	58.7%	179	100.0%	
Family Type	***Nuclear Family***	42	43.8%	54	56.3%	96	100.0%	X^2 = 0.592 df = 1 p = 0.442
	Extended Family	32	38.1%	52	61.9%	84	100.0%	
Highest level of Education	***Below G.C.E. O/L***	4	44.4%	5	55.6%	9	100.0%	X^2 = 9.376 df = 3 p = 0.025
	Up to G.C.E. O/L	26	50.0%	26	50.0%	52	100.0%	
	Up to G.C.E. A/L	31	47.7%	34	52.3%	65	100.0%	
	Certificate/Degree/Diploma	13	24.1%	41	75.9%	54	100.0%	
Employment Status	***Employed***	32	39.5%	49	60.5%	81	100.0%	X^2 = 0.157 df = 1 p = 0.692
	Unemployed	42	42.4%	57	57.6%	99	100.0%	
Monthly Income of the Family	***< 75 000***	48	50.0%	48	50.0%	96	100.0%	X^2 = 6.714 df = 1 p = 0.010
	≥ 75 000	26	31.0%	58	69.0%	84	100.0%	
Gravidity	***1***	35	42.2%	48	57.8%	83	100.0%	X^2 = 0.071 df = 1 p = 0.790
	2 or more	39	40.2%	58	59.8%	97	100.0%	
Parity	***0***	39	43.8%	50	56.2%	89	100.0%	
	1	21	38.9%	33	61.1%	54	100.0%	
	2 or more	14	37.8%	23	62.2%	37	100.0%	X^2 = 0.544 df = 2 p = 0.762

No. of weeks of pregnancy at the time of data collection	***0-13 weeks***	13	50.0%	13	50.0%	26	100.0%	$X^2 = 3.889$ df = 2 p = 0.143
	14-27 weeks	40	45.5%	48	54.5%	88	100.0%	
	28-42 weeks	21	31.8%	45	68.2%	66	100.0%	
Average birth spacing between successive pregnancies in years	***≤1***	4	57.1%	3	42.9%	7*	100.0%	df = 1 p = 0.434[c]
	≥2	35	38.9%	55	61.1%	90*	100.0%	
Dietary Pattern	***Vegetarian***	3	75.0%	1	25.0%	4	100.0%	df = 1 p = 0.307[c]
	Not vegetarian	71	40.3%	105	59.7%	176	100.0%	

***The participants who were pregnant for the first time were excluded (n=83) C= Statistical test performed was Fisher's Extract Test

According to this study, n=89 (47.8%) of the population has a poor knowledge while 52.2% (n=94) of the study subjects have good knowledge regarding deficiency anaemia. There is no statistically significant association between level of knowledge and age, ethnicity, marital status, family type, employment status, obstetrics associated factors, source of knowledge, and frequency of attendance to MOH clinic as shown in the table 5. There is a statistically significant association between the level of knowledge and the highest level of education (X2 = 9.376, df= 3, p= 0.025). The participants whose highest level of education falls under the class- certificate/degree/diploma have good knowledge on deficiency anaemia compared to the other highest education level classes. There is a statistically significant association between the level of knowledge and monthly income of the family. (X2 = 6.714, df= 1, p= 0.010). Participants with a monthly income ≥ LKR.75 000 have a better knowledge than participants with a lower monthly family income.

Discussion

Most of the pregnant mothers in this study population had good knowledge towards deficiency anaemia during pregnancy. The preponderance of the study population (90.6%) had heard of the word "deficiency anaemia". This finding is parallel to a study done among pregnant mothers attending antenatal clinics in Woldia town, North-Eastern Ethiopia, in which more than half, 224 (54.1%), of the respondents had good knowledge about anaemia. (5) In contrast, a study conducted at Sri Manakula Vinayagar medical college hospital, Puducherry, India revealed that only 39.87% of the participants were aware of and understood the word anaemia. (6). Although, majority in the current study had a good overall knowledge, knowledge on certain aspects of deficiency anaemia were unsatisfactory.

In this study, 95.1% identified iron deficiency anaemia as a correct type of deficiency. The value was higher than reported in another Sri Lankan study among pregnant mothers in the first trimester. Only 60% of the respondents have heard about iron deficiency anaemia after they got pregnant.(7) Only 38.0% identified folate deficiency anaemia. This value is less than a similar finding presented by a study done in Pumwani maternity hospital, Kenya, in which 73% had heard about folic acid.(8). Only 10.4% (n= 17) identified that vitamin B12 deficiency could lead to deficiency anaemia during pregnancy. Sufficient literature was not found to comment on Knowledge of pregnant mothers towards vitamin B12 deficiency anaemia.

Awareness on iron deficiency anaemia among the study population was satisfactory, while the knowledge regarding folate was relatively poor and knowledge towards vitamin B12 was extremely low. A sizable proportion erroneously identified vitamin C (31.3%) and calcium (27.6%) deficiency as correct types of deficiency anaemias.60.7% identified low Hb level in blood as the correct definition of anaemia. The remaining 19.0% defined anaemia as reduced blood volume. 11.7% chose poor nutrition as the definition for anaemia. 4.9% didn't know the definition of anaemia. A similar study conducted in Sri Lanka(7) showed that 65 %, 60 %, 80 % and 30 % of the respondents linked iron deficiency anaemia with low Hb level, poor nutrition, reduce volume in the blood, white colour or pale look of the body respectively. 20% didn't know the meaning of the iron deficiency anaemia in the above study. A study conducted among pregnant mothers in Tabuk region in Egypt found that no one gave the correct answer to the definition of iron deficiency anaemia and 54.3% either didn't know the answer or gave an incorrect answer.(9). In the present study, only 46.6% identified full blood count was the diagnostic test, while 33.7% identified as a simple blood test. Remaining 19.6% was not aware of the diagnostic test. Another study showed that, 0 respondents had knowledge towards diagnostic tests and 43.0% gave an incomplete answer, while remaining 57.0% didn't know the answer. (9)

Regarding the correct symptoms and signs of deficiency anaemia, tiredness and dizziness, headache, pale colour of the body, pale colour of the nails and tongue and shortness of breath was identified by 84.7%, 33.7%, 57.1%, 20.9% and 15.3% of the population, respectively. In a similarstudy, (7) 90% of participants found tiredness and headache, 85% found pale colour of the body

and 80% found pale colour of the nail, tongue and mucous membrane of mouth as signs and symptoms of iron deficiency anaemia. Another similar study reported that, 9.25% identified tiredness and weakness, 17% and 10.5% identified pallor of face and pallor of nails were symptoms of anaemia, respectively. Palpitation and breathing difficulties were identified by only 8.5%. (10)

This study showed that 57.1% and 84.7% identified inadequate food intake and imbalanced diet could predispose to deficiency anaemia. Only 16.6% knew that worm infection was a causative factor. Heavy blood loss and heredity were recognized by 33.1% and 20.9%, respectively. A close study done in Sri Lanka (7) reported a higher value (90%) for inadequate food intake as the most known causative factor. Only 50% knew heredity was responsible for deficiency anaemia. This is higher than the current study's finding. In contrast, an Egyptian study described that only 14.7% correctly identified signs and symptoms, while 49.3% gave incorrect answers and the remaining 36.0% didn't know the answers. (9).

In the present study, low birth weight, premature delivery postpartum anaemia, abortions and maternal death were identified by 76.7%, 50.9%, 30.1%, 40.5% and 28.2% as complications. A parallel study reported the following results. (7) A lesser percentage (32%) was aware of low birth weight as a complication. A lesser percentage (30%) identified premature delivery. Nearly half of the respondents mentioned intrauterine death and abortion as complications. Conversely, another study showed that only 2.0% had awareness on complications 52.3% had no knowledge. (9) 44.8% identified age of the mother higher than 35 years as a potential risk factor. Increased parity, poor birth spacing, and Goitre were identified as correct risk factors by 46.6%, 24.5%, and 4.9%, respectively. The risk of maternal death during labour and foetal growth retardation were reported as consequences of anaemia during pregnancy in a study done among pregnant women in Eritrean refugee camps, northern Ethiopia. (11)

Having a balanced diet was identified as a preventive practice by 95.7% of the present study population. A similar study revealed that 90% participants knew getting a well-balanced diet was a correct preventive method. (7) In a contrast, a study in Karnataka indicated that 57% knew well balanced diet could prevent anaemia during pregnancy. (10) Use of prophylaxis prescribed by the physician was chosen by 73.6% in this study. According to another Sri Lankan study, 96% identified use of iron supplements was a correct preventive method.(7) Another study conducted in Karnataka proclaimed that 68.5% respondents recognized daily intake of iron and folic acid tablet is necessary preventive practice, which is a slightly lesser value.(10) In the present study, treating worm infections and keeping more than 2 years of birth space between consecutive pregnancies were chosen by 20.2%, and 29.4%, respectively as effective ways of preventing deficiency anaemia during pregnancy. A comparable study displayed that 31% participants recognized treating worm infection was a correct method to prevent iron deficiency anaemia. Contrarily, 5% identified keeping more than 2 years of birth space was an accurate method of prevention. (7) Another study indicated that only 7% had given accurate responses to ways of prevention while 59.0% had given incomplete answer. The remaining 34.0% had either given incorrect answers or had nil knowledge. (9) Another study indicated that 64.5% correctly identified treating hook worm infestation as a preventive method. (10)

For the food items that are rich in iron, dark green leafy vegetables, white meat, dried fruits, cereals, sea food, poultry, and red meat were identified by 88.3%, 27.0%, 3.7%, 30.7%, 41.7%, 26.4%, and 52.8% respectively. An equivalent study indicated that more than half of the respondents identified eggs (92%), chicken liver (75%), red meat (72%), green vegetables (68%), grains (61%), fruits (60%), fish (60%) and chicken (54%) as iron rich-food sources. The least known iron-rich food source was enriched cereals. (7) Another comparable study obtained green leafy vegetables and sprouted grains 54.3%, meat 49.0% and liver 48.5% were recognized, respectively as iron rich food items. (10). Only 35.0% of the study subjects identified beef, liver, and chicken as good sources of vitamin B12. Only 24.5% identified milk, yogurt, and dairy products as vitamins B12 enriched food items. Eggs as a food item rich in Vitamin B12 was recognized by 36.8%. Leafy green vegetable, citrus fruits, beans, peas and nuts, whole grains, and liver were identified by 29.4%, 22.1%, and 38.4% as being rich in folate, respectively. Results show that knowledge on food items rich in iron is relatively satisfactory when compared to knowledge on foods rich in vitamin B12 and folate.

Majority knew coffee (83.4%) and tea (71.8%) should be avoided after consuming an iron containing meal. But only 23.9% knew that chocolate should also be avoided after an iron rich meal. As reported by (7) knowledge regarding the effect of coffee (88%) and tea (92%) in the absorption of iron was at a significantly higher level similar to this study findings. Conversely, 44.7% identified tea and coffee had to be avoided after meals to prevent anaemia in a study conducted in Tabuk Region. Foods containing tannin (14.1%) and foods containing phytates (13.5%) were inhibitors of iron absorption from the gut were known by a little population. Similarly, (6) indicated that cereals containing inhibitors for iron absorption was faultily considered as a good source by 18.35% of respondents.

Adding extra lime to gotukola sambal to enhance iron absorption was recognized by 69.3%, while only 50.3% knew that refraining from coffee or tea after a main meal was a good food practice. Having more citrus fruits and green vegetables were

recognized by 42.9% and 44.2%, respectively. Lesser percentage of 30.3% knew of citrus fruits in another study.(9) In another study, 48.0% identified that citrus fruits were promoters of iron absorption.(10). 72.4% identified iron sulphate as a prophylaxis while only 56.4% knew folic acid was also a preventive treatment. A foreign study revealed that 68.5% respondents recognized daily intake of iron and folic acid tablet was a necessity to prevent anaemia. (10) Only 19.0% identified continuation of iron supplements for 6 months after delivery as a correct preventive treatment. In the present study, only 25.2% had learned that B12 supplements was also a prophylactic treatment. The knowledge on vitamin B12 and deficiency anaemia caused by it was unsatisfactory in the present study population, according to the results.

The most popular source of knowledge in this study was nurse/midwife. (n=55, 33.7%) According to a study conducted in Saudi Arabia, 29% had chosen relatives as their source of knowledge. (9) Nevertheless, in the present study, only 1.8% selected family members as their source of knowledge. There was a significantly satisfactory level of attendance to the MOH clinic among the study subjects, as 158 (87.8%) had more than 76% attendance. According to the same study 53.3% participants had shown regular antenatal visit.(9) On the contrary, a cross sectional, descriptive institution-based study conducted in India revealed that the most popular source of knowledge towards iron deficiency anaemia was doctors.(6) In the current study, there was no statistically significant association between the level of knowledge and age, ethnicity, marital status and family type.

There was a statistically significant association between the level of knowledge and the highest level of education (p= 0.025). The participants whose highest level of education fell under the class- certificate/degree/diploma had good knowledge compared to the other classes. This finding is compatible with a cross-sectional study carried out in Karnataka (10). This study found that there was significant association between cause of anaemia and women's education (p<0.001) and there was significant association between sign and symptoms of anaemia and women's education (p<0.001). The study found that there was a significant association between prevention and treatment of anaemia and women's education (p<0.001).(10) Further, a facility-based cross-sectional study, depicted that mothers who had completed secondary education and above were two times more likely knowledgeable about anaemia than mothers who attended non-formal education (AOR = 2.19, 95% CI 1.32- 3.64)(5) Additionally, a multicentre cross-sectional study revealed that the likelihood of knowledge was 2.5 (adjusted odds ratio (AOR) = 2.5, 95% CI: 1.22, 7.75) times greater among secondary school participants than non-school attendees.(12)

There was no statistically significant association between the level of knowledge and employment status in the present study (p=0.692). However, a multicentre cross-sectional study revealed that merchant women were seven (AOR = 7.02; 95% CI: 2.88, 17.09) times more likely to be knowledgeable than housewives. (12)

There was a statistically significant association between the level of knowledge and monthly income of the family. (p= 0.010). Participants with a monthly income ≥ LKR.75 000 had a better knowledge than participants with a lower monthly family income. A study conducted in Southern Ethiopia reported that mothers earning 5000 Ethiopian Birr per month are 55% more likely to have a favourable attitude towards preventive nutritional practices than mothers earning less than 1000 birr per month. (AOR = 0.45; 95% CI: 0.10, 1.66) (12)

There was no statistically significant association between level of knowledge and factors associated with pregnancy (p>0.05). Conversely, a multicentre cross-sectional study observed that compared to primigravida women, multiparous women were 4.8 (AOR = 4.77; 95% CI: 1.15–8.66) times more likely to be knowledgeable. (12)

There was no statistically significant association between the level of knowledge and the source of knowledge, frequency of attendance to MOH clinic. However, a facility-based cross-sectional study conducted in Northern Ethiopia observed that mothers who had four or more antenatal clinic visit were three times (AOR = 3.12, 95% CI 1.38–7.07) more likely knowledgeable on the benefits of iron folic acid supplementation than mothers who had less than four times ANC visit.(5)

External Validity: The study was conducted among pregnant mothers attending selected MOH areas in Colombo district. The selected district being an urbanized area would have a negative effect on generalizability to the Sri Lankan population. Underrepresentation of ethnicities other than Sinhala also might have caused a negative impact on external validity.

Internal Validity: Anonymity of the participants was reassured to reduce the occurrence of social desirability bias. An interviewer administered questionnaire may have caused an interviewer bias. Using a questionnaire validated by a group of experts, pretesting and training of data collectors also might have enhanced the quality of the study.

Limitations: The sample was gathered from two selected MOH areas in Colombo district which is an urbanized area. Furthermore, non-inclusion of mothers receiving antenatal care from private sector and under representation of other ethnicities makes our study population not exactly representing the antenatal clinic attendees of the whole country. Although the questionnaire had a broad context with multiple stems to cover knowledge on anaemia the determination of the exact knowledge was affected by multiple choice options which might have

influenced the answering by guessing and random selection.

Conclusions

Majority of this study population (52.2%) had good knowledge despite the mean score (38.9) of the population was low. 90.6% had heard of the word deficiency anaemia and 95.1% out of them identified iron deficiency anaemia as a correct type of deficiency anaemia. Only 38.0% and 10.4% identified folate deficiency and vitamin B12 deficiency anaemias as correct types of deficiency anaemia, respectively. A sizable proportion erroneously identified vitamin C and calcium deficiency as correct types of deficiency anaemias. The most popular source of knowledge on deficiency anaemia was nurse/midwife. (33.7%) There were statistically significant associations between good knowledge towards deficiency anaemia and higher level of education and high monthly family income. There were no statistically significant associations between the level of knowledge and age, ethnicity, marital status, family type, employment status, obstetrics related factors, source of knowledge, and frequency of attendance to MOH clinic.

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Conflict of Interest:

Authors declare that there is no conflict of interest.
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