RESEARCH ARTICLE

Factors and determinants associated with prevalence of anaemia in adults in Karachi, Pakistan

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Abstract

Objective: To assess the demographic and dietary factors associated with the prevalence of anaemia in multi-ethnic urban settings.

Method: The cross-sectional community-based survey study was conducted from August 2020 to May 2021 in Karachi East district, and comprised healthy adults of either gender aged 20-60 years. Data was collected using a pretested questionnaire. Besides, 4ml sample of whole blood was taken from each participant for haematological analysis. Data was analysed using SPSS 23.

Results: Of the 416 subjects, 269(64.7%) were males and 147(35.3%) were females, while 334(80.3%) were aged <30 years and 82(19.7%) were aged >30 years. Anaemia was found in 92(22.1%) subjects. Female gender, lower and middle socioeconomic class, nuclear family type, habit of meal-skipping, and infrequent consumption of sweets and milk were all linked to anaemia (p<0.05).

Conclusion: Less than a quarter of the sample was found to be anaemic. Steps should be taken to address the identified causes of anaemia.

Keywords: Anaemia, Prevalence, Risk factors, Urban, Karachi. (JPMA 73: 2165; 2023)

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Introduction

Anaemia is a medical condition characterised by a lower-than-normal number of red blood cells (RBCs) or haemoglobin (Hb). Hb is important for the body because it carries oxygen. A decreased Hb level may cause a decreased capacity of the blood to carry oxygen to the various tissues of the body. The signs and symptoms of anaemia include fatigue, weakness, dizziness and shortness of breath.[1] The Hb concentration among individuals varies according to pregnancy, age, gender, the elevation of residence, and habits, including smoking. The causes of anaemia are nutrition and infectious diseases. Based on nutrition, anaemia is classified as iron deficiency anaemia, vitamin B12 deficiency anaemia, and folate deficiency anaemia. Infectious diseases that can potentially cause anaemia include malaria, tuberculosis (TB), human immunodeficiency virus (HIV), and parasitic infections.[2]

Compared to economically backward countries, the prevalence of anaemia among the population of technologically developed countries, including the United States, Germany, France, England, Japan and South Korea, is relatively lower. The higher prevalence of anaemia among the population of low-and middle-income countries (LMICs) is a serious public health problem. Anaemia affects children and pregnant women in particular. According to a report by the World Health Organisation (WHO), 42% of children aged <5 years and 40% of pregnant women worldwide are anaemic.[1] Anaemia affects 47% of non-pregnant women and 60% of pregnant women in South Asia.[3]

Pakistan is facing socioeconomic problems, including unemployment, inflation and income inequalities. According to the latest report issued by the Pakistan Bureau of Statistics, the prices of food has significantly increased.[4] Health profiling of Pakistani population showed that the prevalence of double burden of malnutrition at the household level was 3.93% (urban: 5.62%, rural: 3.20%).[5] Demographic factors and nutritional deficiency may cause several diseases, including anaemia. Previously conducted studies in Pakistan have shown a substantial prevalence of anaemia among the population. A hospital-based study from Lahore showed that among 390 pregnant females, 57.7% were anaemic (34.4% were mildly, and 23.3% were moderately anaemic), and the prevalence was associated with risk factors, like low literacy level, number of family members, rural area, and low income.[6] The National Nutrition Survey showed that among 7,491 non-pregnant females aged 15–50 years, the prevalence of iron deficiency

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anaemia was 18.1%. This survey showed that a lack of iron supplement use and household food insecurity were associated with an increased prevalence of anaemia. Sindh is the second most populated province in Pakistan. According to the National Health Survey (NHS), the prevalence of anaemia among young males in the entire Pakistani population ranges 12-28%, depending on urban/rural status.[7]

A study done in a tertiary care hospital in the metropolitan city of Karachi showed that 51.4% of 493 healthy adult males had anaemia, with mild anaemia being 69%, moderate anaemia 18.4%, and severe anaemia 12.6%. The study's findings revealed a rise in prevalence among individuals aged >50 years, as well as a drop in incidence among younger and middle-aged adults.[8]

In one more study from Pakistan, conducted in the department of pathology in a tertiary care hospital in Peshawar, a total of 16,000 "full blood counts' were reviewed and found the prevalence of anaemia in males was 67.4% and in females 64.5%. The frequency of anaemia was slightly higher amongst males.[9]

Karachi is the largest city of Pakistan, the information about the prevalence of anaemia among general population is inadequate. Several previously conducted studies focused on high-risk groups. These groups include children, patients, pregnant females, adolescent females, and Gutka eaters.[10-13]

There is scarcity of literature on the subject and a literature search on PubMed database using 'anaemia' and 'Karachi'. The current study was planned to fill the gap by assessing the demographic and dietary factors associated with the prevalence of anaemia in Karachi East District, Sindh.

Subjects and Methods

The cross-sectional community-based survey study was conducted from August 2020 to May 2021 in Karachi's East district. Karachi is the capital city of Sindh province. It is a multi-ethnic and multi-cultural city. According to the 2017 census, the population of Karachi city was 14.91 million.[14] Karachi is an industrial hub and generates a significant proportion of tax for the government of Pakistan. Karachi is divided into eight districts, which are, the City Government, Central, East, South, West, Keamari, Korangi and Malir. Korangi and Central districts have high literacy rates. Anaemia probably happens in low socio-economic and low literacy area, and that is why Karachi East district was selected for the study. Karachi East district has five tehsils. According to the 2017 census, the population of Karachi East district was 2,909,921.[14] Open Epi software[15] was used for sample size calculation with 95% confidence interval (CI) and a relative accuracy of 5%. Karachi's East district comprises 509,647 households.[14] Of them, 450 homes were chosen at random by lottery, and if a family had more than one adults, one of them was chosen at random from each family for sampling out of five tehsils. A team of data collectors was formed. Team members were briefed about the project. The team was accompanied by a professional phlebotomist. Participants who volunteered to participate were briefed about the aims, objectives and significance of the study. An informed consent form was offered to them for their signature, which assured confidentiality and secrecy of the participant's personal data. Participants who were illiterate were briefed orally and were asked to use their thumb impression instead of the signature. After obtaining informed consent, the participants were given a pre-structured questionnaire to fill in the information about demography and diet. For illiterate participants, the data collectors narrated the questions and recorded their answers on the questionnaire.

Those included were healthy people of both genders aged 20-60 years. Those outside the age range, lactating and pregnant women, drug addicts, those on any medication, those recently diagnosed with malaria, those whose menstrual cycle had stopped for at least 10 days and those who were not permanent residents of the district were excluded.

Each subject's 4mL anti-coagulated venous blood sample was obtained using a vacutainer device. The samples were then sent to the laboratory within two hours of collection. Complete blood count (CBC) was performed using the sample in ethylenediaminetetraacetic acid (EDTA) tubes. The blood samples were analysed at the research and diagnostic laboratory at Dr Ruth K.M. Pfau Civil Hospital Karachi.

The questionnaire comprised demographic information, including age, gender, monthly income, marital status, family type and education. The dietary factors were classified according to the frequency of eating. The respondents recalled when and how much food was consumed. They were asked how often they had consumed the food items and beverages during the preceding month. The frequency of intake <2 times a week was classified as infrequent, and >3 times a week as frequent. The participants were also asked if they were skipping any meals during the day. Females with Hb concentrations ≤12mg/dl were considered anaemic, and the cut-off value for males was ≤13mg/dl.

Clean data was coded and analysed using SPSS 23. Basic descriptive statistics were applied to generate frequencies and percentages. Cross-tabulation was used to associate

demographic and dietary factors with anaemia, and chi-square as well as binary logistic regression were employed. P<0.05 was considered significant.

Approval for the study was obtained from the ethics review committee of the University of Sindh, Jamshoro.

Results

Of the 451 individuals approached, 416(92.2%) participated. Of them, 269(64.7%) were males and 147(35.3%) were females, while 334(80.3%) were aged <30 years and 82(19.7%) were aged >30 years (Table 1).

Table-1: Basic demographic characteristics (n=416).

Socio-demographic determinants	n (%)
Gender	
Female	147 (35.3)
Male	269 (64.7)
Age (years)	
<30	334 (80.3)
≥30	82 (19.7)
Marital status	
Married	141 (33.9)
Unmarried	275 (66.1)
Education	
Literate	378 (90.9)
Illiterate	38 (9.1)
Socio economic status (SES)	
Lower	118 (28.4)
Middle	243 (58.4)
Upper	55 (13.2)
Family type	
Joint	188 (45.2)
Nuclear	228 (54.8)

Table-2: Association of socio-demographic characteristics with prevalence of anaemia.

Variables	Non-Anaemic (n=324) n (%)	Anaemic (n=92) n (%)	Total (n=416)	x^2	*p*-value
Gender					
Female	71(21.9)	76(82.6)	147	115.5	<0.001
Male	253(78.1)	16 (17.4)	269		
Age (years)					
<30	259(79.9)	75(81.5)	334	0.11	0.73
≥30	65(20.1)	17(18.5)	82		
Marital status					
Married	114(35.2)	27(29.3)	141	1.09	0.2
Unmarried	210(64.8)	65(70.7)	275		
Education					
Illiterate	30 (9.3)	8(8.7)	38	0.27	0.8
literate	294 (90.7)	84(91.3)	378		
Socio economic status (SES)					
Lower	104(32.1)	14 (15.2)	118	15.3	<0.001
Middle	173(53.4)	70(76.1)	243		
Upper	47(14.5)	8(8.7)	55		
Family type					
Joint	163(50.3)	25(27.2)	188	15.4	<0.001
Nuclear	161(49.7)	67(72.8)	228		

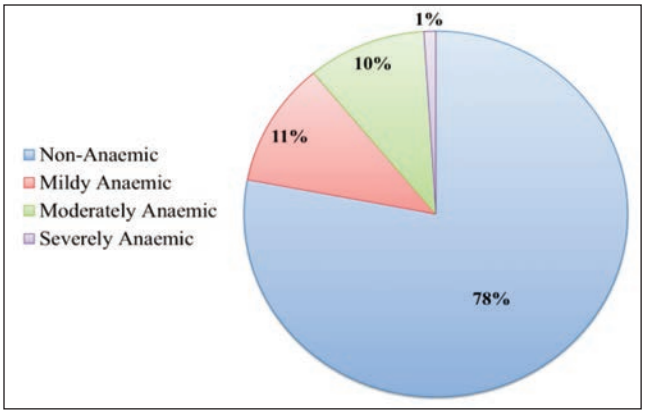

Figure: Prevalence of anaemia and its categorisation among study participants.

Anaemia was found in 92(22.1%) subjects, and they were categorised into mild, moderate and severe cases (Figure).

Female gender, lower and middle socioeconomic status (SES), nuclear family type, habit of meal-skipping, and infrequent consumption of meat, sweets and milk were all linked to anaemia (p<0.05) (Tables 2-3).

Binary logistic regression was used to adjust the dietary factors associated with anaemia along with age (Table 4).

Discussion

The study aimed at determining the prevalence of anaemia in healthy people of both genders who were randomly selected from Karachi's East district. The data collected indicated a higher prevalence of anaemia in female participants. These results are consistent with already published data.[16] The higher prevalence in females might be due to a number of factors, including menstrual bleeding. Pakistan has a moderate iron-deficiency anaemia load, according to WHO guidelines, which is based on the prevalence of anaemia measured exclusively by Hb level.[17]

The prevalence of anaemia was 22.1% in the current study, which was consistent with earlier results of 18.1% in Pakistan[2] and 26.2%in southern India.[18] The prevalence rate of anaemia in Iran was reported at 9.7%.[19] The possible explanation of the relatively low prevalence rate of anaemia in the current study was perhaps the fact that East district is economically prosperous and food-secure.

In the current study, 11.5% of the population were mildly anaemic, 9.6$ moderately anaemic, and 1% severely anaemic. In Bangladesh, mild anaemia affected 35.5% of ever-married women aged 15-49 years, moderate 5.6%, and severe anaemia affected 0.2% of the population.[20] Studies in Ethiopia reported that 15.6% of non-pregnant women aged 15-49 were

mildly anaemic. The obtained results are similar to the mildly anaemic classification used in the current study.[22] In India, studies reported 52.73% mild, 45.89% moderate, and 2.09% severe anaemia.[22]

Table-3: Association of dietary factors with prevalence of anaemia.

Variables	Non-Anaemic (n=324) n (%)	Anaemic (n=92) n (%)	Total (n=416)	x^2	*p*-value
Skip meal distributions					
Breakfast	134(41.4)	39(42.4)	173	9.3	0.02
Dinner	34(10.5)	20(21.7)	54		
Lunch	68(21.0)	14(15.2)	82		
None skip meal	88(27.2)	19(20.7)	107		
Meat					
Infrequently	126(38.9)	44(47.8)	170	2.3	0.1
Frequently	198(61.1)	48(52.2)	246		
Sweets					
Infrequently	178(54.9)	62 (67.4)	240	4.5	0.03
Frequently	146(45.1)	30 (32.6)	176		
Egg					
Infrequently	208(64.2)	60(65.2)	268	0.03	0.8
Frequently	116(35.8)	32(34.8)	148		
Fruits					
Infrequently	110(34.1)	36(39.1)	146	0.8	0.3
Frequently	213(65.9)	56(60.9)	269		
Vegetables					
Infrequently	149(46.0)	41(44.6)	190	0.5	0.8
Frequently	175(54)	51(55.4)	226		
Milk					
Infrequently	160(49.4)	58(63)	218	5.3	0.02
Frequently	164(50.6)	34(37)	198		

Table-4: Binary logistic regression analysis of dietary factors of anaemia adjusted with age.

Variables	Non-Anaemic (n=324) n (%)	Anaemic (n=92) n (%)	Total (n=416)	COR	AOR
Skip meal distributions					
Breakfast	134(41.4)	39(42.4)	173	1.34 [CI 0.73-2.48]	1.32 [CI 0.71-2.44]
Dinner	34(10.5)	20(21.7)	54	2.72 P=0.008 [CI 1.29-5.72]	1.72 P=0.008 [CI 1.29-5.71]
Lunch	68(21.0)	14(15.2)	82	0.95 [CI 0.44-2.03]	0.94 [CI 0.44-2.02]
None skip meal (Ref)	88(27.2)	19(20.7)	107		
Meat					
Infrequently	126(38.9)	44(47.8)	170	1.44 [CI 0.90-2.29]	1.43 [CI 0.89-2.28]
Frequently (Ref)	198(61.1)	48(52.2)	246		
Sweets					
Infrequently	178(54.9%)	62 (67.4)	240	1.69 P value 0.03 [CI 1.04-2.76]	1.69 p value 0.03 [CI 1.04-2.75]
Frequently (Ref)	146(45.1%)	30 (32.6)	176		
Egg					
Infrequently	208(64.2)	60(65.2)	268	1.04 [CI 0.62-1.69]	1.03 [CI 0.63-1.69]
Frequently (Ref)	116(35.8)	32(34.8)	148		
Fruits					
Infrequently	110(34.1)	36(39.1)	146	1.24 [CI 0.77-2.00]	1.23 [CI 0.76-1.99]
Frequently (Ref)	213(65.9)	56(60.9)	269		
Vegetables					
Infrequently	149(46.0)	41(44.6)	190	0.94 [CI 0.59-1.50]	0.93 [CI 0.58-1.49]
Frequently (Ref)	175(54)	51(55.4)	226		
Milk					
Infrequently	160(49.4)	58(63)	218	1.74 P value 0.02 [1.08-2.81]	1.74 p value 0.02 [CI 1.08-2.80]
Frequently (Ref)	164(50.6)	34(37)	198		

The prevalence of anaemia increased in people below 30 years of age. However, it was not significantly associated with anaemia. Many studies have found that age is not a major predictor of anaemia, which is not contradictory to the current findings.[23]

In the current study, the prevalence of anaemia was 82.6% among healthy non-pregnant women. In India, a study reported 64.6% prevalence of anaemia in a tribal population.[24] According to a study from Taiwan, the female gender is linked to anaemia, which is in accordance with the current findings.[25]

In the current study, lower SES (15.2%) and middle SES (76.1%) were found to be significantly associated with a higher prevalence of anaemia than upper SES (8.7%) (*p*=0.001). The findings are consistent with earlier research in Pakistan.[26]

According to the current study, the prevalence of anaemia increased among nuclear families (*p*=0.001). Premalatha, T. et al., in India, observed that girls from nuclear families had a greater risk of anaemia,[27] which was connected to the family type. These findings are consistent with the findings of the current report.

In our study, the infrequent meat consumers were more anaemic and less non-anaemic, whereas the frequent meat consumers were less anaemic and more non-anaemic. One study from Thatta Sindh reported that women who consumed meat had less anaemic and were more non-anaemic as compared to those who did not consume meat, who were more anaemic and less non-anaemic.[15] The results are inconsistent with secondary analysis research on iron deficiency anaemia among non-pregnant women undertaken in Pakistan, which found that the incidence of

anaemia was greater (61.8%) in women who ate meat more than once a week/day as compared to those who ate meat 1-2 times per month.[2] Infrequent milk consumption was significantly with increased prevalence of anaemia, but a population-based study in Taiwan that included both genders found that increased milk intake was more likely to increase anaemia prevalence.[25]

Anaemia was shown to be associated with infrequent sweet-eating, but Paramastri R. et al. showed in research on Taiwanese people that excessive sugary beverage consumption significantly increased the risk of anaemia.[25] Meal-skipping is when one or more of the traditional main meals are skipped or not consumed during the day. According to the Australian Bureau of Statistics, the Australian Health Survey 2011 reported that young individuals indulge in unhealthy dietary habits, such as a lack of fruit and vegetable consumption.[27] Current data revealed that in comparison to skipping lunch, skipping dinner and breakfast was significantly connected to anaemia prevalence (p=0.02).

The current study has limitations. Owing to the cross-sectional design, the study provides a snapshot of prevalence of anaemia in Karachi East district and temporal variations may be considered. Parasitic infections and types of anaemia could not be detected.

Despite the limitations, however, the current study, to the best of our knowledge, is the first done in Karachi to evaluate the factors and determinants related to anaemia prevalence in the general healthy population.

In the lights of the findings, it is recommended that community-based research should be conducted in all districts of Karachi. Urban females are at greater risk of anaemia than urban males. This needs further investigation. In this regard, it is suggested that reproductive factors and consumption of micronutrients should be considered in future studies. The Sindh government should conduct mass screening for anaemia in females in Karachi to assess the actual prevalence of anaemia in the general population, and devise strategies to reduce the burden of anaemia.

Conclusion

The nutritional situation of urban females in Karachi was found to be poor. The demographic characteristics of the participants, such as female gender, middle and lower SES, nuclear families, and nutritional factors like irregular dietary habits, infrequent consumption of meat, sweet and milk, and meal skipping were linked to a higher prevalence of anaemia.

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