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**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.2528793>Available online at: <http://www.iajps.com>**Research Article****PREVALENCE OF ANEMIA AND ITS ASSOCIATION WITH DIETARY  
HABITS AND BODY MASS INDEX OF ADULTS IN AL MADINAH,  
SAUDI ARABIA**Asma M. Alhazmi <sup>1</sup>, Safiah A. Alenezi <sup>2</sup>, Moayad A. Karboji <sup>1</sup>, Raneem A. Faidh <sup>3</sup>, Abdulrahman M. Aldhilan <sup>3</sup>, Sofyan H. Yamani <sup>1</sup>, Zakarya M. Alhawasawi MD <sup>4\*</sup><sup>1</sup> Medical Intern, Taibah University, Al Madinah, Saudi Arabia<sup>2</sup> Medical Student, Faculty of Medicine, Taibah University, Al Madinah, Saudi Arabia<sup>3</sup> Medical Laboratory Technologist, Faculty of Applied Medical Sciences, Taibah University, Al Madinah, Saudi Arabia<sup>4</sup> Assistant Professor and consultant Hematologist, Department of Pediatrics, College of Medicine, Taibah University Al Madinah, Saudi Arabia**Abstract:**

**Objective:** The aim of this study is to determine the prevalence of anemia among adults living in Al Madinah, Saudi Arabia and its relation to their dietary habits and body mass index (BMI). **Method and Materials:** A cross-sectional analytical study was conducted in Al-Madinah city from May to end of November, 2017, at a shopping mall, university and central blood bank. We screened 675 adults from 18 to 49 years old with exclusion of those with chronic, cardiac and blood disorders. Data were collected using an interview based questionnaire containing questions about dietary habits. Hemoglobin levels were measured using HemoCue device with normal cut-off values of 13.5 to 17.5 g/dl for males and 12.0 to 15.5 g/dl for females. BMI was calculated using weight in kilograms divided by the square of the height in meters (kg/m<sup>2</sup>). **Results:** Out of 675 participants, 192 (28.4%) were anemic while 483 (71.6%) were non-anemic. Within anemic only 20 (10.4%) were males while 172 (89.6%) were females (p=0.000). Higher anemia rates were found in participants with normal BMI (46.9%) (p=0.042). Participants who consume meat three times or more per week, only 26.6% of them were anemic, while those who never consume meat, as high as 40.8% of them were anemic (p=0.001). Participants who eat fast food three times or more per week, only 24.5% of them were anemic, while those who eat fast food 1-2 times per week, 59.4% of them were anemic (p=0.012). Those who consume soft drinks three times or more per week, only 24.0% of them were anemic compared to those who never consume soft drinks, 38.5% (p=0.002). **Conclusions:** A substantial proportion of the adult population is anemic with higher prevalence among females. Normal BMI is significantly related to higher anemia rates. The dietary habits associated with decreased anemia rates are meat, fast food and soft drinks consumption. These findings highlight the importance of encouraging weekly meat consumption and promoting iron supplementation especially for females.

**Keywords:** Anemia, Iron deficiency anemia, Hemoglobin, BMI, Dietary habits.**Corresponding author:****Asma M. Alhazmi,**

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## INTRODUCTION:

Anemia is a significant public health problem and it has adverse impacts on social and economic states [1-4]. It is defined by WHO as Hb <130 g/L in adult male older than 15 years, <120 g/L in non-pregnant female older than age 15 years and 110 g/L in pregnant women older than 15 years [5]. Globally, anemia affects 24.8% of world population, which corresponds to 1.62 billion people. The most significant contributor to anemia among many other causes is iron deficiency [6].

Iron deficiency anemia (IDA) is one of the most global nutritional deficiencies and it is around one half of anemia cases in the world [7-8] with 75% prevalence among other types of anemia [9], affecting 30% of population [9]. A total of 149 million people in the Eastern Mediterranean Region (EMR) are anemic or iron deficient according to the World Health Organization (WHO) [10]. In Saudi Arabia, the overall prevalence of iron deficiency anemia was 30–56% [11]. A recent study was done in Al Madinah City, Saudi Arabia on female university students with age range 20–31 years showed that 64% of the students were found to have IDA [12].

The major factors that causes IDA are insufficient intake of iron and/or factors that affect its absorption [13]. The other factor that could be attributed to the occurrence of IDA is poor nutritional habits [14]. Eating non-nutritional food is becoming common practice among the Saudi population [15]. In 2013, a national Saudi survey showed that 31.6% of the population consumed less than one serving per day of vegetables and fruits [16]. A recent study was done in Al Madinah city, among female university students revealed that nearly half of the students (49.3%) were consuming fresh vegetables and fruits less than one serving per week [17].

Iron deficiency anemia was more prevalent in many studies among overweight and obese adults [18-23]. In Saudi Arabia, obesity is considered a major health problem. According to a survey done in 2013, 59.4% of the Saudi population are overweight (Body Mass Index (BMI) of  $\geq 25.0$  kg/m<sup>2</sup>) and 28.7% are obese (BMI of  $\geq 30$  kg/m<sup>2</sup>) [16]. A national study was done in 2007, revealed that the prevalence of obesity in Riyadh capital city of Saudi Arabia was 21.7% while 15.1% in Al Madinah city [24].

In Al Madinah, Saudi Arabia few studies were done to address the problem of anemia with the association of the dietary habits of the adult population [17]. Therefore, the aim of the present study is to determine the prevalence of anemia among male and

female adults living in Al Madinah, Saudi Arabia and its relation to their dietary habits and BMI.

## MATERIAL AND METHODS:

A cross-sectional analytical study was conducted in Al Madinah city, Saudi Arabia during the period of May to end of November 2017 at a shopping mall, University and a central blood bank. Study participants was recruited by convenient sampling method. Visitors were asked to participate in the study, as well as donors visiting the blood bank at the time period of the study. All citizens of Al Madinah who are 18 to 49 years old were included in the study regardless of gender and nationality. Those who are not citizens of Al Madinah were excluded as well as patients who have chronic, cardiac, renal or blood disorders. Estimated sample size of 784 was calculated using the statistical website OpenEpi for sample size frequency in infinite population assuming a prevalence of 50% and at 3.5% precision and at statistical power of 95%. Using the equation  $n = [DEFF * Np(1-p)] / [(d^2 / Z^2 * 1 - \alpha / 2 * (N - 1) + p * (1 - p))]$  (10). The study was approved by the ethics committee of college of medicine at Taibah University. Written informed consent was obtained voluntarily from all participants after explaining the aim and nature of the study. Privacy and confidentiality was assured.

Data was collected using an interview form designed in Arabic language, that includes Sociodemographic data, brief medical history (chronic diseases, history of bleeding, personal diagnosis of blood diseases or having blood diseases in family, diagnosis of iron deficiency anemia, history of blood transfusions, number of times of blood donation, drug use, iron supplements use), nutritional habits which include questions about weekly food frequency (Number of daily meals, eating regular breakfast meals, number of times eating red meats, green vegetables, dairy products, fast food, soda drinks, coffee and tea per week) and measurements results: (weight, height, Body mass index and hemoglobin Level)

After filling the form, participants' weights, heights, Body mass index (BMI) and Hemoglobin (Hb) level were measured and added to the data collection form. Body Mass Index (BMI) was calculated using the weight in kilograms divided by the square of the height in meters (kg/m<sup>2</sup>). A value of BMI < 18.5 kg/m<sup>2</sup> was considered as underweight, 18.5–24.9 kg/m<sup>2</sup> was considered as normal weight, 25.0–29.9 kg/m<sup>2</sup> was considered as pre-obese (overweight), and BMI  $\geq 30$  was considered as obese [5]. Hb level was measured using (HemoCue® Hb 201+ System)

device. A cutoff value of normal Hb level was considered as: men, 13.5 to 17.5 g/dl - women, 12.0 to 15.5 g/dl [25].

#### Studied Variables:

Our main outcome variable: hemoglobin level.  
Studied Risk factors: BMI and Nutritional habits

#### Data Management

The incharge research personnel has gathered and collected all the data for this project using MS Excel. It was then screened and recoded for the purpose of statistical data analysis. Suspicious data had been validated and cleaned whenever necessary. Questionnaires with doubtful response in a serious manner had been excluded from the data set.

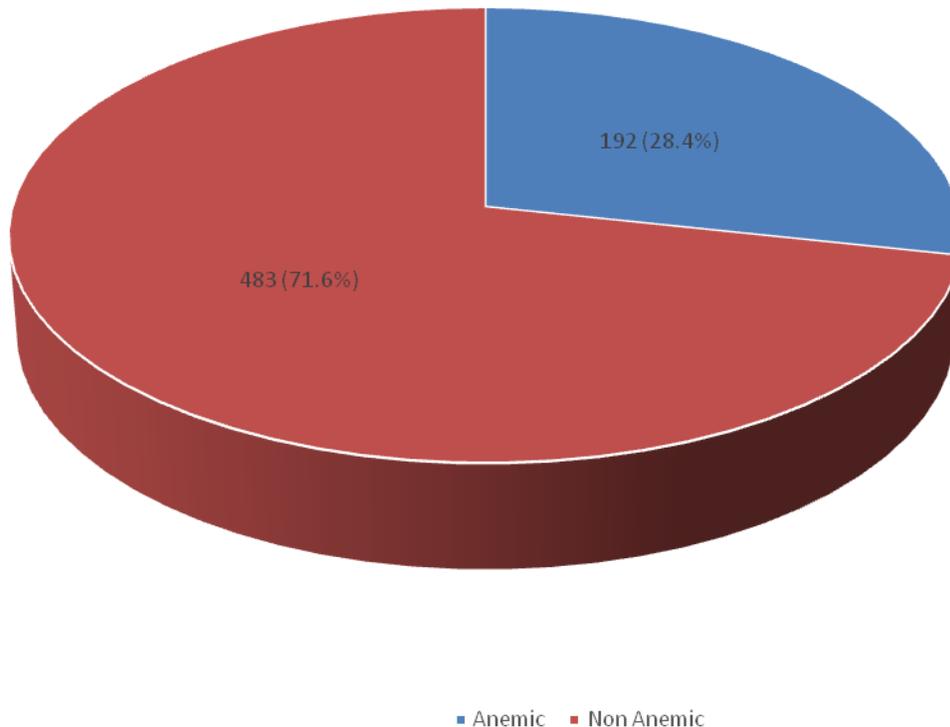
#### Statistical Analysis Method

The data analysis was performed by using Statistical Packages for Software Sciences (SPSS) Ver. 21 where both descriptive and inferential statistics had

been conducted. P-value of  $\leq 0.05$  had been accepted as significance level for all statistical tests. All categorical variables included in this study had been presented as numbers and percentages (%). The section that evaluates the association between the studied variables and the outcome variables had been conducted using chi-square test. Regression analysis had been conducted as well to predict the influence of anemia from the socio demographic characteristics and dietary habits of participants with odds ratio and confidence interval had also been reported.

#### RESULTS:

We collected 862 participants during the course of data collection out of which 187 had been excluded due to not meeting the inclusion criteria sets in the methodology part of this study. The concluding number of recruited participants were 675 respondents. The prevalence of anemic in this study revealed 192 yielding an overall percentage of 28.4% (**Figure 1**).



**Figure 1: Prevalence of Anemia among studied participants**

Age range was from 18 to 49 years old where more anemic found on less than 25 years of age group compared to 25 or more (p=0.139). Female anemic was a dominant factor compared to male (p<0.001). We also observed that more respondents with normal BMI were anemic compared to underweight, overweight and obese (p=0.042). University degree shows more anemic compared to those high school or below group (p=0.053). Marital status shows positive association (p=0.011) where single group was more anemic compared to married and divorced or widowed. Significant difference found on occupational status (p<0.001) where unemployed with anemia was slightly higher compared to employed and students. Those without family history of Iron deficiency were more anemic compared to its counterpart and statistical revealed significant

association (p<0.001). History of IDA also shows positive association (p<0.001) where those without history were slightly higher anemic as opposed to those with history of IDA. Significant difference was also found on history of blood donation (p<0.001) where nearly all participants without history of blood donation were anemic. With regards to iron supplement, those participants with no iron supplement were more anemic compared to its opposite group and the statistical test showed significant relationship (p<0.001) while smoking also shows significant association (p<0.001) where most of the participants who don't smoke were anemic. However, we also found negative association on monthly income (p=0.069) and history of blood receiving (p=0.153) (Table 1).

**Table 1: Description of socio demographic characteristics according to hemoglobin level**

| Study Variables        | Overall<br>(n=192)<br>N (%) | Hemoglobin Level           |                                | P-value § |
|------------------------|-----------------------------|----------------------------|--------------------------------|-----------|
|                        |                             | Anemic<br>(n=192)<br>N (%) | Non-Anemic<br>(n=483)<br>N (%) |           |
|                        |                             |                            |                                |           |
| Age group in years     |                             |                            |                                |           |
| • <25 years old        | 374 (55.4%)                 | 115 (59.9%)                | 259 (53.6%)                    | 0.139     |
| • ≥25 years old        | 301 (44.6%)                 | 77 (40.1%)                 | 224 (46.4%)                    |           |
| Gender                 |                             |                            |                                |           |
| • Male                 | 302 (44.7%)                 | 20 (10.4%)                 | 282 (58.4%)                    | <0.001 ** |
| • Female               | 373 (55.3%)                 | 172 (89.6%)                | 201 (41.6%)                    |           |
| Classification of BMI  |                             |                            |                                |           |
| • Underweight          | 60 (08.9%)                  | 19 (09.9%)                 | 41 (08.5%)                     | 0.042 **  |
| • Normal               | 266 (39.4%)                 | 90 (46.9%)                 | 176 (36.4%)                    |           |
| • Overweight           | 200 (29.6%)                 | 45 (23.4%)                 | 155 (32.1%)                    |           |
| • Obese                | 149 (22.1%)                 | 38 (19.8%)                 | 111 (23.0%)                    |           |
| Monthly Income (SAR) † |                             |                            |                                |           |
| • <5,000               | 315 (57.2%)                 | 83 (51.2%)                 | 232 (59.6%)                    | 0.069     |
| • ≥5,000               | 236 (42.8%)                 | 79 (48.8%)                 | 157 (40.4%)                    |           |
| Educational level      |                             |                            |                                |           |
| • High school or below | 260 (38.5%)                 | 85 (44.3%)                 | 175 (36.2%)                    | 0.053 **  |
| • University degree    | 415 (61.5%)                 | 107 (55.7%)                | 308 (63.8%)                    |           |
| Marital Status         |                             |                            |                                |           |

|                                   |             |             |             |                     |
|-----------------------------------|-------------|-------------|-------------|---------------------|
| • Single                          | 438 (64.9%) | 120 (62.5%) | 318 (65.8%) |                     |
| • Married                         | 223 (33.0%) | 63 (32.8%)  | 160 (33.1%) | <b>0.011 **</b>     |
| • Divorced or Widowed             | 14 (02.1%)  | 09 (04.7%)  | 05 (01.1%)  |                     |
| Occupational Status               |             |             |             |                     |
| • Employed                        | 224 (33.2%) | 47 (24.5%)  | 177 (36.6%) |                     |
| • Unemployed                      | 177 (26.2%) | 77 (40.1%)  | 100 (20.7%) | <b>&lt;0.001 **</b> |
| • Student                         | 274 (40.6%) | 68 (35.4%)  | 206 (42.7%) |                     |
| Family History of Iron Deficiency |             |             |             |                     |
| • Yes                             | 199 (29.5%) | 80 (41.7%)  | 119 (24.6%) |                     |
| • No                              | 476 (70.5%) | 112 (58.3%) | 364 (75.4%) | <b>&lt;0.001 **</b> |
| History of IDA                    |             |             |             |                     |
| • Yes                             | 159 (23.6%) | 86 (44.8%)  | 73 (15.1%)  |                     |
| • No                              | 516 (76.4%) | 106 (55.2%) | 410 (84.9%) | <b>&lt;0.001 **</b> |
| History of Blood receiving        |             |             |             |                     |
| • Yes                             | 36 (05.3%)  | 14 (07.3%)  | 22 (04.6%)  |                     |
| • No                              | 639 (94.7%) | 178 (92.7%) | 461 (95.4%) | 0.153               |
| History of Blood donation         |             |             |             |                     |
| • Yes                             | 235 (34.8%) | 23 (12.0%)  | 212 (43.9%) |                     |
| • No                              | 440 (65.2%) | 169 (88.0%) | 271 (56.1%) | <b>&lt;0.001 **</b> |
| Iron Supplement                   |             |             |             |                     |
| • Yes                             | 82 (12.1%)  | 44 (22.9%)  | 38 (07.9%)  |                     |
| • No                              | 593 (87.9%) | 148 (77.1%) | 445 (92.1%) | <b>&lt;0.001 **</b> |
| Smoking                           |             |             |             |                     |
| • Yes                             | 143 (21.2%) | 18 (09.4%)  | 125 (25.9%) |                     |
| • No                              | 532 (78.8%) | 174 (90.6%) | 358 (74.1%) | <b>&lt;0.001 **</b> |

† Excluded cases without income. IDA – Iron Deficiency Anemia; BMI – Body Mass Index. §P-value has been calculated using chi square test. \*\* Significant at  $p \leq 0.05$  level.

Association between dietary habits and hemoglobin level has been elaborated at **table 2**. Eating meat per week revealed significant association ( $p=0.001$ ) where majority of participants who eat meat 1 – 2 times per week were rated higher as anemic compared to those 3 times or more and those never eat meat. Significant difference was also found on eating fast food ( $p=0.012$ ) with 1 – 2 times per week group was more anemic compared to 3 times or more and those who never eat fast food chain while soft drink consumption per week also revealed a significant factor ( $p=0.002$ ) where those never drink soft drink found to be slightly higher with anemia compared to other categories.

Consequently, we found insignificant association for the following dietary habits such as; regularity of breakfast, tea consumption per week, coffee consumption per week, eating vegetable per week and consumption of milk per week.

**Table 2: Association between Dietary habits and hemoglobin level**

| Dietary habits variables    | Overall<br>(n=192)<br>N (%) | Hemoglobin Level           |                                | P-value §       |
|-----------------------------|-----------------------------|----------------------------|--------------------------------|-----------------|
|                             |                             | Anemic<br>(n=192)<br>N (%) | Non-Anemic<br>(n=483)<br>N (%) |                 |
| Regularity of breakfast     |                             |                            |                                |                 |
| • Always                    | 243 (36.0%)                 | 62 (32.3%)                 | 181 (37.5%)                    |                 |
| • Sometimes                 | 354 (52.4%)                 | 100 (52.1%)                | 254 (52.6%)                    | 0.087           |
| • Never                     | 78 (11.6%)                  | 30 (15.6%)                 | 48 (9.9%)                      |                 |
| Tea consumption per week    |                             |                            |                                |                 |
| • 1 – 3 cups                | 213 (31.6%)                 | 67 (34.9%)                 | 146 (30.2%)                    |                 |
| • ≥4 cups                   | 338 (50.1%)                 | 87 (45.3%)                 | 251 (52.0%)                    | 0.292           |
| • Never                     | 124 (18.4%)                 | 38 (19.8%)                 | 86 (17.8%)                     |                 |
| Coffee consumption per week |                             |                            |                                |                 |
| • 1 – 3 cups                | 202 (29.9%)                 | 55 (28.6%)                 | 147 (30.4%)                    |                 |
| • ≥4 cups                   | 348 (51.6%)                 | 105 (54.7%)                | 243 (50.3%)                    | 0.561           |
| • Never                     | 125 (18.5%)                 | 32 (16.7%)                 | 93 (19.3%)                     |                 |
| Eating vegetable per week   |                             |                            |                                |                 |
| • 1 – 2 times               | 424 (62.8%)                 | 119 (62.0%)                | 305 (63.1%)                    |                 |
| • ≥3 times                  | 202 (29.9%)                 | 59 (30.7%)                 | 143 (29.6%)                    | 0.957           |
| • Never                     | 49 (07.3%)                  | 14 (07.3%)                 | 35 (07.2%)                     |                 |
| Eating meat per week        |                             |                            |                                |                 |
| • 1 – 2 times               | 354 (52.4%)                 | 113 (58.9%)                | 241 (49.9%)                    |                 |
| • ≥3 times                  | 248 (36.7%)                 | 51 (26.6%)                 | 197 (40.8%)                    | <b>0.001 **</b> |
| • Never                     | 73 (10.8%)                  | 28 (14.6%)                 | 45 (09.3%)                     |                 |
| Drinking milk per week      |                             |                            |                                |                 |
| • 1 – 2 times               | 223 (33.0%)                 | 67 (34.9%)                 | 156 (32.3%)                    |                 |
| • ≥3 times                  | 399 (59.1%)                 | 110 (57.3%)                | 289 (59.8%)                    | 0.806           |
| • Never                     | 53 (07.9%)                  | 15 (07.8%)                 | 38 (07.9%)                     |                 |
| Eating Fast food per week   |                             |                            |                                |                 |
| • 1 – 2 times               | 356 (52.7%)                 | 114 (59.4%)                | 242 (50.1%)                    | <b>0.012 **</b> |

|                                 |             |            |             |                 |
|---------------------------------|-------------|------------|-------------|-----------------|
| • $\geq 3$ times                | 223 (33.0%) | 47 (24.5%) | 176 (36.4%) |                 |
| • Never                         | 96 (14.2%)  | 31 (16.1%) | 65 (13.5%)  |                 |
| Soft drink consumption per week |             |            |             |                 |
| • 1 – 2 times                   | 213 (31.6%) | 72 (37.5%) | 141 (29.2%) |                 |
| • $\geq 3$ times                | 231 (34.2%) | 46 (24.0%) | 185 (38.3%) | <b>0.002 **</b> |
| • Never                         | 231 (34.2%) | 74 (38.5%) | 157 (32.5%) |                 |

§P-value has been calculated using chi square test. \*\* Significant at  $p \leq 0.05$  level.

Regression analysis was conducted at **table 3** to ascertain the influence of anemia among socio demographic characteristics and dietary habits of participants. Regression analysis included in the model such as; age group in years, gender, classification of BMI, educational level, marital status, occupational status, smoking, eating vegetable per week, eating meat per week, drinking milk per week, eating fast food per week and soda consumption per week. Analysis revealed that gender (odds ratio 12.066,  $p < 0.001$ ), classification of BMI (odds ratio 1.539,  $p = 0.013$ ), marital status both single (odds ratio 4.770) and divorced/widowed (odds ratio 4.571,  $p = 0.008$ ), occupational status on student (odds ratio 0.429,  $p < 0.001$ ), smoking (odds ratio 3.375,  $p < 0.001$ ), without meat consumption per week (odds ratio 2.403,  $p = 0.002$ ), without eating fast food per week (odds ratio 1.786,  $p = 0.034$ ) and without soda consumption per week (odds ratio 1.896,  $p = 0.003$ ) were all shows significant influence on anemia. Other variables included in the model such as age group in years, eating vegetable per week and drinking milk per week were not significant factors of anemia.

**Table 3: Regression analysis to predict Anemic from the selected socio demographic characteristics and dietary habits of participants**

| Factors                | Odds Ratio | 95% CI         | P-value §           |
|------------------------|------------|----------------|---------------------|
| Age group in years     |            |                |                     |
| • <25 years old        | Ref        |                |                     |
| • $\geq 25$ years old  | 1.035      | 0.712 – 1.506  | 0.856               |
| Gender                 |            |                |                     |
| • Male                 | Ref        |                |                     |
| • Female               | 12.066     | 7.339 – 19.836 | <b>&lt;0.001 **</b> |
| Classification of BMI  |            |                |                     |
| • Normal               | Ref        |                |                     |
| • Abnormal             | 1.539      | 1.097 – 2.159  | <b>0.013 **</b>     |
| Educational level      |            |                |                     |
| • High school or below | Ref        |                |                     |
| • University degree    | 0.715      | 0.509 – 1.005  | <b>0.053 **</b>     |
| Marital Status         |            |                |                     |
| • Single               | Ref        |                |                     |
| • Married              | 4.770      | 1.567 – 14.520 | <b>0.006 **</b>     |

|                           |       |                |                     |
|---------------------------|-------|----------------|---------------------|
| • Divorced or Widowed     | 4.571 | 1.475 – 14.172 | <b>0.008 **</b>     |
| Occupational Status       |       |                |                     |
| • Employed                | Ref   |                |                     |
| • Unemployed              | 1.243 | 0.815 – 1.897  | 0.313               |
| • Student                 | 0.429 | 0.286 – 0.642  | <b>&lt;0.001 **</b> |
| Smoking                   |       |                |                     |
| • Yes                     | Ref   |                |                     |
| • No                      | 3.375 | 1.994 – 5.713  | <b>&lt;0.001 **</b> |
| Eating vegetable per week |       |                |                     |
| • 1 – 2 times             | Ref   |                |                     |
| • ≥3 times                | 1.025 | 0.533 – 1.974  | 0.941               |
| • Never                   | 0.969 | 0.486 – 1.933  | 0.930               |
| Eating meat per week      |       |                |                     |
| • 1 – 2 times             | Ref   |                |                     |
| • ≥3 times                | 1.327 | 0.787 – 2.237  | 0.288               |
| • Never                   | 2.403 | 1.368 – 4.222  | <b>0.002 **</b>     |
| Drinking milk per week    |       |                |                     |
| • 1 – 2 times             | Ref   |                |                     |
| • ≥3 times                | 0.919 | 0.474 – 1.783  | 0.803               |
| • Never                   | 1.037 | 0.549 – 1.960  | 0.911               |
| Eating Fast food per week |       |                |                     |
| • 1 – 2 times             | Ref   |                |                     |
| • ≥3 times                | 1.012 | 0.625 – 1.640  | 0.960               |
| • Never                   | 1.786 | 1.046 – 3.050  | <b>0.034 **</b>     |
| Soda consumption per week |       |                |                     |
| • 1 – 2 times             | Ref   |                |                     |
| • ≥3 times                | 0.923 | 0.621 – 1.372  | 0.692               |
| • Never                   | 1.896 | 1.239 – 2.900  | <b>0.003 **</b>     |

CI – Confidence Interval; BMI – Body Mass Index. \*\* Significant at  $p \leq 0.05$  level.

**DISCUSSION:**

According to the study, Iron Deficiency Anemia (IDA) accounts for 75% of all types of anemia in the third world, affecting 30% of population [9]. In the Eastern Mediterranean Region (EMR) alone there were 149 million of people who were either iron deficient or anemic according to the World Health Organization (WHO) [10]. In Saudi Arabia the estimated prevalence of IDA was 30–56% [11]. The prevalence of anemia in the present study revealed 192 yielding an overall percentage of 28.4%. Several studies published locally distinguished the prevalence of anemia among Saudi population [10,12,17,26,27,28]. Study published by Al Hassan tackled “the prevalence of iron deficiency anemia in a Saudi University female student.” [12]. Among 268 female students he surveyed, there were 40% of them found to be anemic which was the highest prevalence being accounts locally. This is contrary to the report being published by Albalkhail and Shawky [28]. The study was about “Prevalence of daily breakfast intake, iron deficiency anemia and awareness of being anemic among Saudi school children.” They found out that among 800 Saudi students, 20.5% of them were anemic which deemed the lowest prevalence in a study being published here in Saudi Arabia. Incidentally, our report was consistent from the study published by Hanafi et al and Al Sayes et al. [17,26] where both of the studies accounted prevalence of 32.2% and 23.9% respectively. In abroad, incidence of higher rates of anemia varies on the region [29-35]. An article from Pakistan published by Baig-Ansari and colleagues accounted the highest prevalence of anemia with 90.5% [31]. While the report published by Balci et al registered the lowest incidence of anemia with only 05.6%.

In this paper we also observed that majority of the participants with normal BMI were anemic where it also indicates positive association toward anemia. This report was consistent to the study published by Al-Quaiz et al and Baig-Ansari et al. [10] [31] According to their findings, BMI was a significant factor of anemia. In opposing view, Hanafi et al, Al Sayes et al, and Albalkhail and Shawky found no difference in the relationship of BMI and anemia [17,26,28]. We also measured the relationship between socio demographic characteristics of participants against anemia. Based on our analysis gender, educational level (marginal), marital status, occupational status, family history of iron deficiency, history of IDA, history of blood donation, iron supplement and smoking were found to have significant relationship among anemic group of participants. Different articles exemplified the relationship of socio-demographic characteristics and anemia with each article had distinctive findings

[17,26,31,34]. The most common associated factor being identified in each study was about age group in years. In the likelihood effect of a certain variable among anemia group, based on our analysis, gender, classification of BMI, marital status, occupational status, smoking, red meat consumption, eating fast food per week and Soft drink consumption per week were all shows significant influence on anemia. There were different papers both local and abroad presented regression model in regards to the independent factors of anemia [10,33,34,35]. However, they commonly agreed that age group in years was the most significant influencer of anemia. We also measured the association of dietary habits and anemia, in this paper we found significant association on the following dietary habit variables such as; eating meat per week (p-0.001), eating fast food per week (p-0.012) and consumption of soft drink per week (p-0.002). Various published papers in the same context assessed the association between dietary habits and anemia [10,17,26,31]. Most of them were consistent that eating red meat was a significant factor of disease [10,26,31]. In general, the outcome of this study provided additional insights regarding the phenomena of this study discipline. However, due to some study limitations and inconsistencies of some study variables, recommendation of further research in the same context is highly recommended involving bigger sample size and the addition of more important variables to assess better the relationship of anemia according to the personal health characteristics of individual being studied.

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