**Original Article**

# Intake of Junk Food as an Etiological Factor of Megaloblastic Anemia in Patients visiting Mayo Hospital, Lahore

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## Abstract

**Objective:** The study was performed to determine role of junk food intake in the development of megaloblastic anemia.

**Methodology:** It was a clinical based cross-sectional study conducted at Mayo Hospital Lahore in collaboration with Pathology Department of King Edward Medical University from June 2017 to June 2021. All the patients of age 7 to 70 years including males and non-pregnant females attending the Out Patient Department or admitted in the hospital and having hemoglobin values<12 gm/l, MCV more than 95 fl and bone marrow examination suggestive of a megaloblastic change in the marrow (WHO criteria)were included in our study. The patients who had received blood transfusion or hematinic in less than 6 months before diagnosis and pregnant females were excluded from our study. A total 1333 patients were screened, out of which only 160 patients were diagnosed with megaloblastic anemia who had undergone bone marrow trephine biopsy. Their dietary history was taken in detail and history of depression was noted on validated questionnaires. The obtained data was analyzed on the basis of age groups (7-25 years, 26-50 years, 51-75 years) using SPSS descriptive analysis and results were formulated.

**Results:** The study revealed that 160 (12%) of total 1333 patients were diagnosed with megaloblastic anemia on bone marrow trephine biopsy with male to female ratio of 1:1.28. Total 58 (36%) patients belonged to 1-25 years age group 68 (43%) patients to 26-50 years age group and 34 (21%) patients belonged to 51-75 years age group. Junk food consumption was seen (60.3%) in 7-25 years age group as a prevalent etiological factor.

**Conclusion:** Junk food consumption is the major cause of megaloblastic anemia in young population and poor diet in middle age group, whereas comorbidities are the major etiological factor in older people.

**Keywords:** Megaloblastic anemia, Diet, Junk food consumption, Public health, Comorbidities.

## Introduction

Anemia is one of the most common diseases affecting up to one third of world's population. It is defined as reduction in hemoglobin levels decreased red blood cells count or both. The etiology of anemia can be described in terms of Mean Corpuscular Volume(MCV). It is classified as microcytic (MCV<80 fl) normocytic (MCV 80-100 fl) and macrocytic (MCV >100 fl).[1] Macrocytosis is identified on automated red cell indices and peripheral blood film which is more sensitive. It is broadly divided into megaloblastic and non-megaloblastic types which is confirmed on bone marrow examination.[2] Megaloblastic anemia is characterized by the presence of megaloblastic erythroid precursor cells in the bone marrow. These cells are large in size have immature nuclear chromatin pattern and show asynchrony between nucleus and cytoplasm.[3] It is a common public health problem with a high morbidity rate all over the globe. However limited data is available about its etiological factors in our country. Through this study, we aimed to identify the role of junk food intake in the development of megaloblastic anemia to establish a better treatment and prevention approach.

Megaloblastic anemia results from a large number of causes. However, the major cause is the conditions leading to vitamin B12 and folate deficiency.[4] Both vitamin B12 and folic acid are obtained from diet. Vitamin B12 is obtained from animal sources like meat and dairy products whereas folic acid is mainly obtained from vegetables and cereals.[5] Nearly one third cases of megaloblastic anemia are due to nutritional deficiency. Other causes of vitamin B12 deficiency are pernicious anemia, gastric surgery, intestinal disease and inherited disorders involving transport and absorption of vitamin B12. Folic acid deficiency can be caused by malabsorption, especially in conditions with increased requirements like pregnancy and rapid growth.[6] Another major problem is the increased consumption of junk food which has become a trend in Pakistan due to urbanization. Junk food has low levels of essential nutrients for our body which can deteriorate health if consumed frequently.[7] There is no standard definition of junk foods in the academic literature and most research presume that only products under categories such as salty snacks, desserts and sweets are deemed junk meals. As a result, products that include excessive levels of saturated fat, energy, added sugar, or salt are not classified as junk food (including sandwiches with fewer healthful ingredients, juice drinks, and bakery products) have been omitted from this classification.[8] Studies have shown that nutritional anemia is common in junk food consumers as compared to those who do not consume junk food on daily basis.[9] Meg-

aloblastic anemia has become a major public health problem with increased incidence in the past few decades. Using simple dietary modification, folic acid fortification and lifestyle modifications not only megaloblastic anemia can be cured but can be prevented as well.[10] Dietary habits are an important element of people's lifestyles since they affect health, illness and death for a variety of disorders.

The objective of this study was to determine the role of junk food in the development of megaloblastic anemia which we thought of as an important etiological factor of this disease. By proving its role in the etiology of megaloblastic anemia, we have helped the clinicians in understanding the factors not usually considered important in the disease history and will help clinicians to focus on them.

**Methodology**

It was a clinical based cross-sectional study conducted at Mayo Hospital Lahore in collaboration with Pathology Department, King Edward Medical University, Lahore from June 2017 to June 2021. All the patients of ages between 7 to 70 years including males and non-pregnant females attending the outpatient department or admitted in the hospital and having hemoglobin values<12 gm/L, MCV more than 95fl and bone marrow examination suggestive of a megaloblastic change in the marrow (WHO criteria)were included in our study. The patients who had received blood transfusion or hematinic in less than 6 months before diagnosis and pregnant females were excluded from our study. After taking consent of university review board all the previous data including personal information, medical history, physical examination and investigations of included patients were obtained. This data was reviewed by 2 different people to exclude observational bias. The complete blood count using automated sysmex blood cell counter for Hemoglobin Levels (Hb), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Total Leucocyte Count (TLC) and platelet count at the time of diagnosis were observed. Those who had megaloblastic features on bone marrow trephine biopsy were approached for study purpose after institute's permission keeping full confidentiality. Junk food included processed food items like confectioneries/desserts, snacks, fried potatoes, cold beverages, ice creams, pizza, burgers and cheese items. Operational definition of junk food intake was given as intake of any of the listed items once a day for 3 days in a week. The junk food intake was assessed using short form of Fast Food Questionnaire (FFQs) designed by Health Behaviour in School-aged Children (HBSC) study protocol. Poor diet intake was associated with socioeconomic status and it was also assessed using modified form of SES (Socio Economic Status) questionnaire.

In case of comorbidities, the confirmation of diagnosis was established. The data was obtained on the individual proformas of the patients which was strictly used for study purposes only. After obtaining all the required data, statistical analysis was done using SPSS V20 software. The frequency of patients with megaloblastic anemia was calculated. The frequencies of categorical variables were calculated using descriptive statistics. The total patients were divided in 3 groups according to z-score based on age (7-25 years, 26-50 years and 51-75 years). The prevalence of etiological factors in all age groups was obtained using descriptive analysis and the correlation was established between the etiological factors and age group using Chi-Square test on SPSS and results were tabulated. All the patients were counselled as a part of routine procedure and were called to assess the clinical outcome.

**Results**

During our study period of 3 years a total 1333 patients underwent bone marrow biopsy out of which 160 (12%) patients had megaloblastic features on bone marrow trephine biopsy and were diagnosed with megaloblastic anemia. A total 90 (56.25%) patients were females and 70 (43.75%) patients were males. The mean age for male patients 32.86 years and for females 32.8 years showing standard deviation SD of 17.9. The female patients outnumbered the male patients with a male to female 1:1.28. Out of all the patients, 58 (36%) belonged to the age group 7-25 years, 68 patients (43%) belonged to the age group 26-50 years and 34 patients (21%) belong to the age group 51 to 75 years (Table 1).

In the first 1 to 25 years age group junk food consumption was the major etiological factor present in 55.% of patients with a statistically significant correlation (p<0.001), comorbidities were present in 18.1% patients (p value=0.026) Poor dietary intake was present in 31.4% patients (p<0.01). In the second age group of 26 to 50 years and the third age group of 50 to 70years a remarkable decrease in the intake of junk food was observed but the prevalence of comorbidities subsequently increased. Table 2. is a depiction of the percentage of junk food consumed by all the three age groups along with resulting comorbidities. Thable-3 highlights the prevlence of visceromegaly due to intake of junk food and associated comorbidities.

**Table 1.** Patients prevalence according to gender and age Groups.

| Years | Females n(%) | Males n(%) | Frequency (%) | Cumulative Percent |
|---|---|---|---|---|
| 1-25yr | 34(38) | 24(34) | 58 | 36.3 |
| 26-50yr | 41(46) | 27(39) | 68 | 78.8 |
| 51-75yr | 15(17) | 19(27) | 34 | 100.0 |
| Total | 90(100) | 70(100) | 160 | 100.0 |

**Table 2.** Prevalence of Etiological Factors in each Age Group

| Year | Causes of Megaloblastic Anemia | | | | | | |
|---|---|---|---|---|---|---|---|
| | Comorbidity | | Junk food consumption | | Poor diet | | |
| | Count | n% | Count % | n% | Count% | n | % |

| Age Group | | n | % | n | % | n | % |
|---|---|---|---|---|---|---|---|
| Age Gropup | 1-25yr | 8 | 18.1 | 35 | 55.5 | 17 | 31.4 |
| | 26-50yr | 14 | 31.8 | 22 | 34.9 | 32 | 59.2 |
| | 51-75yr | 22 | 50 | 6 | 9.52 | 5 | 9.2 |
| Total | | | 44 | 100 | 63 | 100 | 54 | 100 |

**Table 3.** Showing the prevalence of visceromegaly in association with etiological factors.

| Vis-ceromegaly | Etiology | | | | | |
|---|---|---|---|---|---|---|
| | Comorbidity | | Junk food consumption | | Poor diet | |
| | n | % | n | % | n | % |
| None | 5 | 16.60 | 64 | 96.90 | 53 | 82.80 |
| Present | 25 | 83.30 | 2 | 3.03 | 11 | 17.10 |
| Total | 30 | 100 | 66 | 100 | 64 | 100 |

**Discussion**

Megaloblastic anemia has shown increased prevalence in the adolescent age in the past few decades all over the world. However, it is more prevalent in countries where malnutrition is a major problem. In Pakistan insufficient data is present regarding its prevalence and etiology. We aimed at determining the frequency and major etiological factors keeping the specific age groups of patients in consideration.

Our study has shown that out of 1333 patients 320 patients were diagnosed with megaloblastic anemia out of which 160 (12%) patients had frank megaloblastic anemia on bone marrow biopsy. Prevalence of megaloblastic anemia is higher in underdeveloped countries like ours owing to economical strains and lack of nutritional awareness besides many other factors.[11] A study done by Magnani et al. in India (2017) showing 12.35% prevalence of megaloblastic anemia among the included population which is in accordance with our study.[12]

Most of the patients present at adolescent age group with a mean age of 32 years showing a female predominance (male to female ratio 1:1.28). A study by Sufi et al. in 2017 has shown that the mean age of presentation of megaloblastic anemia is 31.8+-7.7 years.[13] Another study done by Pandya et al. has shown that highest incidence of megaloblastic anemia is seen in age 40 to 49 years with a female preponderance.[14] Similarly, study done by Khanduri et al.[15] and by Haq et al. in 2012[16] has shownprevalence of megaloblastic anemia in 60 % females with common age of presentation of 40 years.

In our first age group (7-25yr) junk food consumption is the major etiological factor in the development of megaloblastic anemia present in 60 percent of patients. The trend of junk food has become rampant due to urbanization, convenient approach, attractive advertisement and sedentary lifestyle mainly. A study performed by Dunford et al. in 2022 has shown that increased trend of junk food intake is prevalence in youngsters which leads to development of nutritional anemia.[17]

Diet has a major role in the development of megaloblastic anemia. Inadequate diet including decreased intake of fresh vegetables and meat causes folate and vitamin B12 deficiency.[18] In country like Pakistan, socioeconomic burden is the major culprit. Most of the population cannot afford a healthy diet and suffer from diseases associated with poor nutritional intake. Our study has shown that poor diet consumption is the most common etiological factor in all age groups more specifically in middle age which is also the most prevalent age group suffering from megaloblastic anemia. Other causes of vitamin B12 and folic acid deficiency are also present but, in our country dietary causes predominate. Although folic acid fortification has shown a decrease in megaloblastic anemia development in reproductive age but still dietary insufficiency remains a major factor being more prevalent in adults and old age.

Iron deficiency anemia is one of the most commonly associated comorbidities seen in patients of megaloblastic anemia. Both of the anemias are nutritional anemias and can coexist in any patients with nutritional deficiency. A study done by Solmaz. Solmaz in 2014[19] has shown high prevalence of iron deficiency anemia in patients with megaloblastic anemia especially in elderly population. They have also emphasized on the screening of such patients for iron deficiency as it can be masked in patients with megaloblastic anemia. The association of megaloblastic anemia has also been established in patients with acute lymphoblastic leukemia however the pathophysiology is unclear yet.[20]

Mild to moderate splenomegaly is present in patients with megaloblastic anemia as discussed in a study by Behera v. in 2015.[21] They have also reported a case of megaloblastic anemia presenting as splenomegaly that improved after treating the patient. However, it is an uncommon mode of presentation. Our study has shown that visceromegaly is not seen in 122 (76.2 %) and those showing visceromegaly (either hepatomegaly, splenomegaly or both) has associated comorbidities.

In our study we have tried to discuss etiological factors associated with megaloblastic anemia in detail after extensive literature review using validated screening questionnaires but it is difficult to determine the etiology with precision in all individuals. The situation becomes more challenging in elderly patients where different etiologic factors exist at the same time which poses a limitation in our study. Megaloblastic anemia can result in high morbidity but it is a chronic condition that develops over a long period of time thus can be prevented easily once the etiological factors are known. Most of the patients do not present in emergency due to megaloblastic anemia. Hematinic should be started after doing vitamin B12 and folic acid assays. It should be known that hematinic and blood transfusion provide a short-term re-

covery a proper diet with follow up is mandatory for complete recovery. The most important factor is prevention using life style modification and improving mental and physical health. Most of our young population is unaware of ailments and detrimental health effects resulting from junk food consumption. Health awareness programs should be arranged to highlight the importance of healthy eating. The screening for associated comorbidities is recommended.

**Conclusion**

Megaloblastic anemia has shown a prevalence of 12% in our study. It can occur in any age group but commonly affected people are 26-50 years old. Junk food consumption and depression have the main etiological role in youngsters and elderly population respectively. Poor diet and nutrition status equally affect all the population. Prevention can be done using health awareness programs to improve mental and physical health.

**Limitations of this study**

The major limitation of this study is that we could not exclude all co-morbidities from our study, and they can be the major contributing factor in causing me aloblastic anemia, especially in the older age group.

**Conflict of interest**: All authors declare no conflict of interest.

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