Vitamin B12 deficiency is a serious health problem that can result in megaloblastic anemia, inhibition of cell division, and neurological disorders. Our study aims to identify the correlation between the deficiency of vitamin B12 and the hematological parameters, also the prevalence of vitamin B12 deficiency among vegetarian and non-vegetarian people of the city of Anand in Gujarat state. We evaluated the clinical picture, hematology indices of 100 patients with reduced vitamin B12 level. In this study secondary data on age, sex, referring unit, religion and dietary history of these patients were obtained from the medical laboratory of Dr. Krunal in Anand district, Gujarat, India. We found the gender is significantly associated with hemoglobin. Vegetarian females have lower hemoglobin level than vegetarians males. Outcome of 77% of patients had normal ranges of MCV which tells us that MCV is not the only diagnostic parameter for vit.B12 deficiency. Vitamin B12 deficiency is mainly mild to moderate (100pg/ml – 210pg/ml). Severe B12 deficiency (≤ 100 pg/ml) is more involved in the younger age group (<50 years) than the older group (> 50 years). The peripheral blood film mainly shows Normochromic Normocytic RBCs during B12 deficiency in both vegetarians and non-vegetarians. Neurological symptoms of vitamin B12 deficiency include numbness and tingling of the hands and feet, decreased sensation, difficulties walking, loss of bowel and bladder control, memory loss, dementia, depression, general weakness and psychosis. Unless detected and treated early, these symptoms can be irreversible (Zeuschner et al., 2012).

Measurement of total vitamin B12 is simple, inexpensive and widely available, but it lacks both sensitivity and specificity. A recent report shows 46.9% of non-anemic adult subjects having subnormal levels of vitamin B12. Another study showed 60% of vegetarians and 39% of no vegetarians were B12 deficient. Erythrocyte indices have been used in the initial evaluation of anemic patients; high Mean corpuscular volume (MCV) value is a criterion for the diagnosis of folate and vitamin B12 deficiencies. There is no large study of the prevalence of B12 deficiency among patients with normocytosis or microcytosis (Björkergen & Svärdssudd, 2003).
were males and 55 (55%) who were females. Our studies depicts that out of the total 100 patients there were 81(81 %) patients who followed a vegetarian diet and 19 (19%) who were non-vegetative, and among the vegetarian patients 35 (43%) were males and 46 (56.7%) were females and among the non-vegetarians there were 10 males (52.6%) and 9 (47.3%) were females. (See figure 1)

Out of 100 patients who were vitamin B12 deficient 4% had high MCV (>100 fl). 19% had low MCV (<76 fl) and 77% were with normal values of MCV (76 - 100 fl). Also this study had 73(73%) mild to moderate (> 100 pg/ml) vit.B12 deficiency, while 27(27%) had severe deficiency of vit.B12 (≤ 100 pg/ml).

Vegetarians and non-vegetarians among those who have severe Vit.B12 deficiency (less than 100 pg/ml) females are more dominant (16 %) than males (11%). Those who have Vit.B12 more than or equal 100 pg/ml Females are more dominant (39%) then males (34%).

There is a statistically mean difference between the two vitamin B12 deficient groups according to the sex with a (p-value of 0.000).

Figure (1): Percent distribution of Vitamin B12 deficiency in vegetarians and non-vegetarians according to Gender

Table (1): Distribution of vitamin B12 by the number of Patients and the mean of MCV (fl)

<table>
<thead>
<tr>
<th>Vit.B12 (pg/ml)</th>
<th>No % of patients</th>
<th>Mean MCV (fl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 100 pg/ml</td>
<td>27 %</td>
<td>84.0</td>
</tr>
<tr>
<td>100 – 210 pg / ml</td>
<td>73 %</td>
<td>81.1</td>
</tr>
</tbody>
</table>

Table (1): Out of 100 patients 73(73%) had mild to moderate (> 100 pg/ml) vit.B12 deficiency, while 27(27%) had severe deficiency of vit.B12 (≤ 100 pg/ml)

Table (2): Comparison between the mean levels of Vit.B12, Hb and MCV in Vegetarians and Non-Vegetarians

<table>
<thead>
<tr>
<th>Type</th>
<th>B12</th>
<th>Hb</th>
<th>MCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarians (81)</td>
<td>135.47</td>
<td>12.71</td>
<td>82.01</td>
</tr>
<tr>
<td></td>
<td>38.68</td>
<td>2.10</td>
<td>11.20</td>
</tr>
<tr>
<td>Non Vegetarians (19)</td>
<td>148.89</td>
<td>13.41</td>
<td>83.36</td>
</tr>
<tr>
<td></td>
<td>41.40</td>
<td>2.02</td>
<td>7.71</td>
</tr>
</tbody>
</table>

Table (2): the mean levels of Vit.B12, Hb and MCV were higher in Non-Vegetarians compared to Vegetarians. The mean levels were (148.89, 13.41 and 83.36) respectively in Non-Vegetarians. But in Vegetarians, the mean level were (135.47, 12.71 and 82.01) respectively.

Table (3): Relationship between Hemoglobin and MCV with respect to the low vit.B12 level in vegetarians according to Gender.

<table>
<thead>
<tr>
<th>Hemoglobin (g/dl)</th>
<th>Females SD.</th>
<th>Males SD.</th>
<th>P – value t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCV (fl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.7</td>
<td>1.8</td>
<td>14.1</td>
<td>1.6</td>
</tr>
<tr>
<td>79.70</td>
<td>11.14</td>
<td>84.02</td>
<td>10.10</td>
</tr>
</tbody>
</table>

Table (3): Shows the mean of Hb g/dl for males is 14.1 and that for females is 11.7. The mean difference of Hb g/dl, is 2.46 in favor of males. In order to test whether the mean difference is significant or not, the t-test for testing the null hypothesis that, there is no significant difference in the means between vegetarian males and females, against the alternative hypothesis that the Hb g/dl mean difference is a significant difference. As can be seen from Table 6, the t-test shows that the mean difference is highly significant with (p-value == 0.000). The mean difference of MCV in both males and females is weakly significant with a (p-value = 0.07).

DISCUSSION:
The results obviously showed that vitamin B12 deficiency was higher with the vegetarian diet and the incidence was more in women 55 (55 %) than men 45 (45 %). that confirmed by the previous studies that reported The percentage of vit.B12 deficiency was much higher in vegetarians than non-vegetarians(Kankonkar et al., 2004; Mangukuiya, Modi, Chaurasia, Modi, & Shah, 2011; Zeuschner et al., 2012).

In the present study, the distribution of vitamin B12 deficiency shows that vit.B12 deficiency occur mainly in vegetarians 81(81%) and rarely occurs in non-vegetarians 19(19%) which agrees with the results of most studies(Kankonkar et al., 2004; Mangukuiya et al., 2011).

Vegetarian Females are more exposed to vit.B12 deficiency 46(56.7%) than vegetarian Males 35(43.2%) while non-vegetarian males are exposed to vit.B12 deficiency 10(52.6%) more than non-vegetarian females 9(47.3%) which agrees with other results of previous work were done before (Farmer, 2009; SINGH, GUPTA, VENKATESAN, & ARORA).

Traditionally, vitamin B12 deficiency is suspected in subjects with macrocytic anemia, but many previous studies have shown that Microcytic anemia and macrocytic anemia are often not present in subjects with vitamin B12 deficiency. In the present study, Microcytic anemia was recorded in 19.7%, and macrocytic anemia in 3.7% of vegetarians while in non-vegetarians Microcytic anemia occurs in 10.5% and macrocytic anemia don’t occur 0% (Table 3) with low total vitamin B12. Overall, Microcytic anemia or macrocytosis did not predict vitamin B12 deficiency. 84% of patients would be misdiagnosed if only MCV was used according to other studies(Loikas, 2007).

The prevalence of vit.B12 deficiency according to the vit.B12 serum level (≥ 100 pg/ml) was 39 % in females and 34 % in males, of which our results were similar to those of the other studies, the prevalence of vit.B12 deficiency in females was more than males(Lankarani et al., 2015). But in severe vitamin B12 deficiency (< 100 pg/ml) in females was 16 % and was 11 % in males; therefore, the percentage of severe deficiency is higher in females. The present study was similar to another study, where the results showed that, the prevalence of vit.B12 deficiency weren’t based on age groups but rather were statistically significant in gender (P value = 0.000)(Lankarani et al., 2015)(Table 4)

Most of the populations in India are vegetarians due to cultural and religious reasons. A vegetarian diet is considered to promote health and longevity by protecting against conditions such as cardiovascular disease (CVD) and cancer; however this diet may be deficient in some nutrients. Especially a strict vegetarian diet has been associated with increased risk of vitamin B12 deficiency. (2)
MCV, which agrees to another study (Lankarani et al., 2015).

This present study shows that patients with B12 cutoff (≤ 100 pg/ml) represent 27(27%) of them are less than 50 years and 7(26%) of them are bigger than 50 years. while those who have a cutoff (>100 pg/ml) represent 73(73%), 52(71%) of them are less or equal to 50 years and 21(29%) are bigger than or equal 50 years. These findings agree to another study (Khosravandehloo, Vakili, Hashemian, & Zardini, 2015).

27% of patients from both categories (veg. and non veg.) had vit.B12 level less than 100pg/ml and 73% of them had vit.B12 level more than 100 pg/ml. It appears that the Mean of MCV tend to be higher in lower vit.B12 levels, which agrees with another study (Jain, Kapil, & Gupta, 2012).

A statistically significant (P value = 0.000) relationship between Hemoglobin with vegetarian males and females who have vit.B12 deficiency has been found in the present study. Females tend to have lower hemoglobin levels than males with a mean difference of 2.46. MCV has a weak mean significant difference (p value = 0.07) with vegetarian males and females who are vit.B12 deficient, (Table 1) this finding is in accordance with that of another study (Björkegren, 2003; Khanna, Lal, Kommi, & Chakraborty, 2006).

No statistical significance between Hb and MCV according to the age (Table 2) (p-value 0.2 and 0.1 respectively) has been found which tells us there is no age dependence of Hb or MCV among vit.B12 deficiency patients according to another study (Björkegren, 2003).

CONCLUSION:
In our study, we concluded that the vegetarians have lower serum vitamin B12 levels compared to non-vegetarians. Also, the mean levels of Hb and MCV in this population were higher in Non-Vegetarians compared to Vegetarians.

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