

**ANEMIA.... AN ONGOING CHALLENGE - A FOCUS ON THE ANEMIC PARAMETERS OF ADULTS OF ASIA**

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**ABSTRACT**

The persistent presence of anemia worldwide is an ongoing challenge for physicians across the world and in this global measure Pakistan stands out for its high prevalence of anemia. We did a situation analysis to determine the frequency of anemia and its related particulars in apparently healthy individuals of Pakistan. The study is a cross sectional, observational one conducted in a tertiary care hospital on 1200 adults attending clinic chosen by convenient sampling. Pregnant females and patients of any severe organ insufficiency, stroke, neurodegenerative disease, known blood dyscrasias or terminal illness at baseline evaluation were excluded. With the history and examination, complete blood picture was done to identify anemia, its severity and the Mean Corpuscular Volume. Results; Out of 1200, 627 (52.3%) were anemic. Among 493 males 238 were anemic (51.4%) and in 707 females 389 were anemic (55%). (P=0.01). The mean hemoglobin in males is 12.5+/- 2.4, R -14.9 and in females is 11.7+/- 1.8, R -13.6. 53.5% of the young, 52% in the middle age group, and 50% elderly are anemic (P=0.66). Among the 627 anemic, 423 (67%) had mild, 140 (22%) moderate and 64 (10.2%) had severe anemia. (P=0.000). Mild anemia was most common in the all ages and both genders. (P=0.191). Among the anemic, 256 (40%) had normocytic anemia, 336 (53.5%) had microcytic and 35(5.5%) had macrocytic type. (P= 0.000). Microcytic was prevalent in females and in young and middle age group and normocytic in males and in elderly. The Bengalis, Sindhis, Urdu speaking and Pashtuns were highly anemic. 46% smokers and 49% diabetics were anemic. Logistic regression showed no correlation of hemoglobin to parity or age. Anemia is still prevalent in Pakistan and needs urgent and extensive action to decrease its prevalence.

**KEYWORDS:** Anemia, Hemoglobin, Mean Corpuscle Volume, Erythrocyte indices.

**INTRODUCTION**

Anemia remains a foremost universal health concern, particularly among growing children, females of reproductive age and elderly people and it still has a global prevalence of 33% as stated in 2010.<sup>[1]</sup> The World Health Organization (WHO) estimates that anemia affects approximately 1.62 billion people worldwide, and in spite of its awareness and control measures, the global prevalence of anemia only fell by 0.2 to 0.3 percentage points per year between 1993 and 2013.<sup>[2]</sup>

Anemia leads to a deterioration of mental and physical growth with an overall functional decline of the body, reducing its immunity and hence a compromise in the overall wellbeing of a population, consequently leading to a decline in the economic growth with a loss to the Gross Domestic Product of the country.<sup>[3]</sup> Its timely diagnosis and correction is now an absolute urgency.<sup>[4]</sup> Anemia is a multifaceted disease and both nutritional and

non-nutritional etiologies were identified. The causes of anemia are diverse and multifactorial, but among the leading etiologies in the developing countries are nutritional deficiencies (especially of iron, folate and vitamin B12), chronic or acute blood loss, inherited genetic defects (e.g. thalassemia), chronic diseases and/or inflammatory disorders, malaria, parasitic infestations (e.g. hookworm).

Pakistan alone shares a significant part of the global burden of the anemic manifestation with an estimate of spending three billion dollars on micronutrient deficiencies alone.<sup>[5]</sup> This Pakistan based study is an assessment of the severity of anemia and its extended parameters, to acknowledge any change in its incidence and to discuss the reasons and remedies to resolve this issue.

**OBJECTIVE**

To determine the frequency of anemia and its related parameters in apparently healthy adults.

**METHODOLOGY**

The study was cross sectional, observational conducted in the outpatient clinic of a tertiary care hospital, Creek General Hospital, Karachi from October 2017 to March 2017. The study population was selected using a convenient sampling from the outpatient clinics after consent. The participants included were 1200 in number above 18 years of age. Pregnant females, age less than 18 years and any severe organ insufficiency, stroke, neurodegenerative disease, known blood dyscrasias or terminal illness at baseline evaluation were excluded. A detailed drug history, past history and family history was taken to exclude any possible blood disorders and the CBC report was checked for any suspicion of blood dyscrasias or acute hemolytic conditions and any such found were excluded. After noting the biographic data and required information, a complete blood picture

(CBC) was done by ABX Micros 60 Hematology Analyzer to identify anemia, grade the severity, and classify the red cell indices by Mean Corpuscular Volume (MCV). The data was analyzed on SPSS version 22.

Objective Definitions  
 Anemia (WHO Criteria)  
 Hemoglobin levels;  
 Males; < 13 g/dl  
 Females; <12 g/dl  
 Severity of anemia

| Hemoglobin | Mild         | Moderate   | Severe    |
|------------|--------------|------------|-----------|
| Females    | 10-11.9 g/dl | 8-9.9 g/dl | <8.0 g/dl |
| Males      | 10-12.9 g/dl | 8-9.9 g/dl | <8.0 g/dl |

MCV;  
 Normocytic; 84-96  
 Microcytic; <84  
 Macrocytic; >96

**RESULTS**

Figure 1; Anemia in males according to different age groups

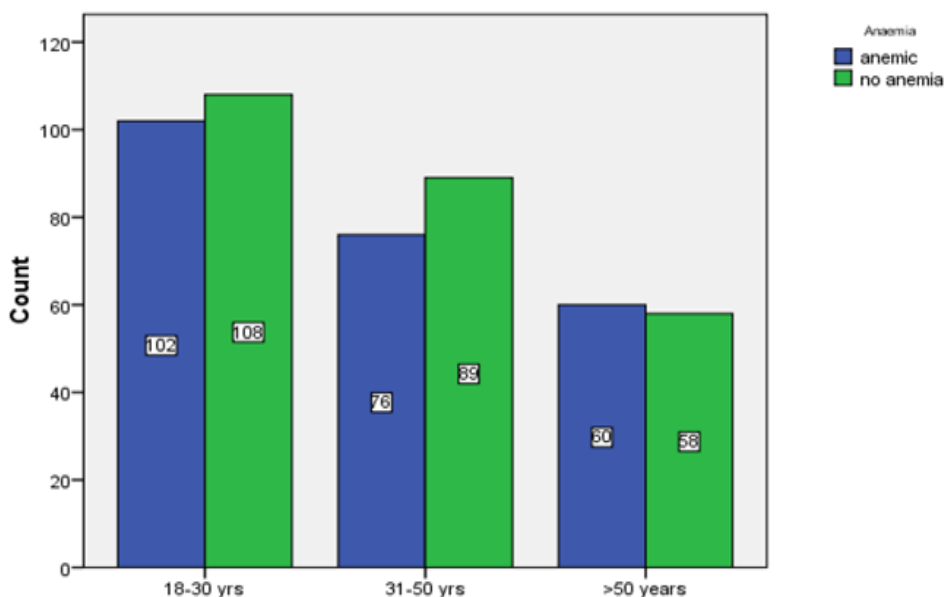


Figure 2; Anemia in females according to different age groups

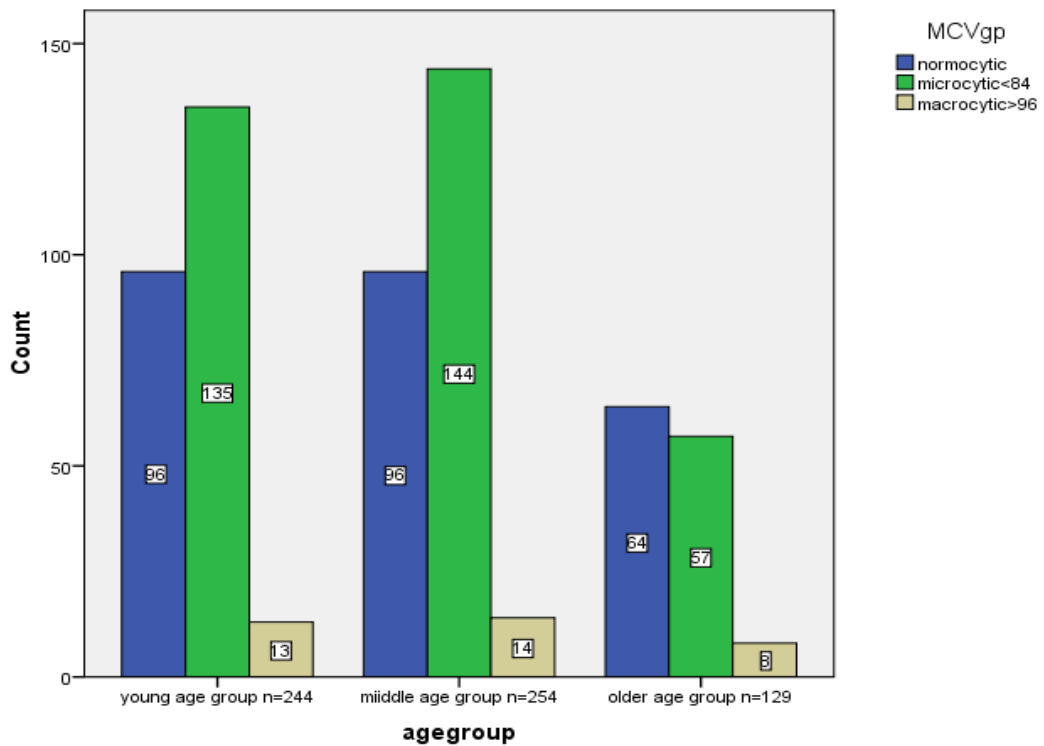
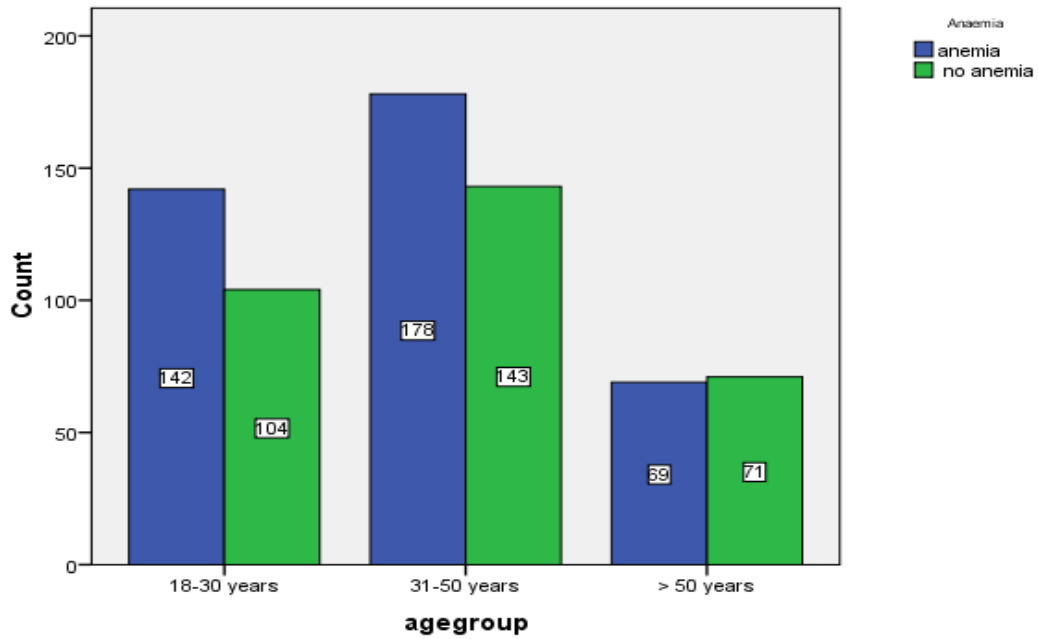


Figure 3: Red cell indices according to age group (P=.200).

**Table I: Severity of anemia according to gender. (P= 0.000).**

|  | N of total anemic in category | N of male anemic in category | % of males out of total anemic of category | N of female anemic in that category | % of females out of total anemic of that category |
|--|-------------------------------|------------------------------|--|-------------------------------------|---|
| Mild (10-12 g in females) (10-13 g in males) | 423                           | 145                          | 34   | 278                                 | 65.7  |
| Moderate (8-10 Hg)                           | 140                           | 50                           | 35.7                                       | 90                                  | 64.2  |
| Severe (<8 Hg)                               | 64                            | 20                           | 31.2                                       | 34                                  | 53.1  |

**Table II: Red cell indices according to gender (P=.000).**

| Red cell indices group | Total no. in that group | Male anemics in that group | % of male anemics to total males in that group | Female anemics in that group | % of female anemics to total females in that group |
|------------------------|-------------------------|----------------------------|--|------------------------------|--|
| Normocytic             | 256                     | 114                        | 44.55  | 142                          | 55.4   |
| Microcytic<84          | 336                     | 98                         | 29   | 238                          | 71   |
| Macrocytic>96          | 35                      | 26                         | 74   | 9                            | 25   |
| Total                  | 627                     | 238                        |  | 389                          |  |

**Table III: Anemia in different ethnic groups and with respect to gender in that ethnic group.**

| Ethnicity group | Total presented | The no. of Anemic/ % anemic in that group | The no. of males of that group | The no. and % of anemic males in that group | The no. of females of that group | The no. and % of anemic females in that group |
|-----------------|-----------------|---|--------------------------------|---|----------------------------------|---|
| Bengali         | 52              | 30(57.6%)                                 | 27                             | 14(56%)                                     | 25                               | 16(64%)                                       |
| Sindhi          | 92              | 51(55%)                                   | 40                             | 24(60%)                                     | 52                               | 27(52%)                                       |
| Urdu speaking   | 631             | 341(54%)                                  | 252                            | 130(51%)                                    | 379                              | 211(55%)                                      |
| Pashtun         | 80              | 43(53.7%)                                 | 35                             | 19(54%)                                     | 45                               | 24(53%)                                       |
| Baluchis        | 23              | 12(52%)                                   | 9                              | 2(22%)                                      | 14                               | 10(71%)                                       |
| Gilgits         | 71              | 35(49%)                                   | 26                             | 12(46%)                                     | 45                               | 23(51%)                                       |
| Punjabis        | 250             | 114(45%)                                  | 104                            | 37(35%)                                     | 146                              | 77(53%)                                       |

The total number of patients included in the study was 1200 of which 493 (41%) were males and 707(59%) were females. Out of 1200 patients, 627(52.3%) were anemic. Out of 493 males, 238 were anemic (51.4%) and among the 707 females, 389 were anemic (55%). (P=0.01). The mean hemoglobin in males is 12.5+/- 2.4, Range-14.9 and in females are 11.7+/- 1.8, Range-13.6.

In the younger age group (18-30 years), 456(38%) presented out of which 244 (53.5%) had anemia. 486(40%) of the middle age group (31 – 50 years) had presented among which 254(52%) were anemic and among the 258(22%) adults in the older group (> 50 years), 129 (50%) were anemic. (P=0.66).The frequency of anemia in different age groups according to gender is shown in Figure 1 and 2.

Regarding the severity, out of 627 anemic, 423(67%) had mild anemia, 140(22%) moderate anemia and 64(10.2%) had severe anemia. (P=0.000). The severity of anemia showed that in the all the groups mild anemia was more prevalent. In the younger group 153 out of 244(63%) had mild anemia, in the middle age group 185 out of 254(73%) anemics had mild anemia, and in elder group 89 out of 129 (70%) anemic had mild anemia. (P=0.191).The severity of anemia according to gender is shown in Table I.

Out of the 627 with anemia, 256(40%) had normocytic anemia, 336 (53.5%) had microcytic and 35(5.5%) had macrocytic type. (P= 0.000). The red cell indices according to the age group are shown in figure 3 and according to the gender is shown in Table II. When each red cell indices was analyzed separately, the macrocytic anemia was although infrequent overall but the ones present were largely in males. The frequency of anemia in various ethnic groups is presented in Table III.

Regarding the association of anemia with parity, 188 women presented in the group of less than 3 children among which anemia was present in 104 (55%). In the group with 4-7 children 147 (52%) out of 281 were anemic, and 46 (55%) out of 83 were anemic in the group who had more than 7 children. Among the 155 that were childless or unmarried 92(59%) were anemic (P=.002). In all the groups the severity of anemia is mild (P=0.05) and the type is microcytic. (P=0.65).

Out of 1119 Muslims, 582(52%) were anemic. In Christians, 42 out of 77(42%) had anemia and out of the 3 Hindus that presented all 3 (100%) had anemia. (P=0.25). Out of the 211 smokers, 98 were anemic (46%) (P=0.075). Among the 151 diabetics, 75(49%) were anemic (P=0.277) among which 56 (75%) had mild

anemia, 19 (25%) had moderate anemia. ( $P=0.027$ ). Logistic regression did not show any correlation between hemoglobin and age or hemoglobin and parity.

## DISCUSSION

Anemia still remains a challenge with a high global prevalence in both genders and all age groups of an apparently healthy population. This study emphasized on the continuity of the problem with a stress on the fact that males are equally affected. Our study shows the prevalence of anemia as 52% while a Pakistani study done in 2010 in Peshawar<sup>[6]</sup> showed a higher frequency but the neighboring country of Iran<sup>[7]</sup> has a lower rate. The mean hemoglobin noted in this study was comparable to one in an Indian study<sup>[8]</sup> but the Peshawar study<sup>[6]</sup> emphasized it to be much lower. Both the males and females had a significant percentage of anemia contradicting the belief that anemia is largely a concern of females which is agreed upon by the Peshawar study.<sup>[6]</sup> This points to the fact that there are factors common to both genders contributing to the cause of anemia like malnutrition, worm infestation, malabsorption, gastric ulcers, and lack of a balanced diet. Another contributory factor in males is the addiction to smoking, niswar and betel nuts and the tendency towards junk food and Fad diets.

In addition to other factors common to both genders, the females are more prone to being anemic due to their hormonal cycles and pregnancies. An Abbottabad study found a similar percentage of anemia in women.<sup>[9]</sup> Poverty worst hits women due to the social norm where females are less privileged in the family which hence leads to malnutrition. This is substantiated by the fact that when a comparison of anemic prevalence was made in women of different parity groups the prevalence was higher in all the groups but was highest in those unmarried or childless. This shows that apart from pregnancies other factors reign in causing anemia which is agreed upon by the high prevalence of anemia in Talpur's study on adolescent girls<sup>[10]</sup> but contradicts an Indian study which shows anemia to be higher in those with high parity.<sup>[11]</sup> Multiple pregnancies do play a role but the factor of malnutrition prevails.

Anemia was ominously present in more than half the population of each age group but interesting was the difference in percentage of anemia in age groups according to gender. In males the elderly group comparatively being more anemic acknowledges the presence of co morbid, gastric ulcers, addiction, and malabsorption as a dominant factor leading to anemia. Elderly females being comparatively less anemic is understandable because of the onset of menopause, their regain in strength and immunity and being less prone to addiction and Fad diet. Mauro's study in Italy also showed elderly males to be more anemic than elderly females.<sup>[12]</sup> An American study agreed that after the age of 50 years, anemia and moderate-severe anemia prevalence increased rapidly with increasing age which

is true in our case for males but not for females.<sup>[13]</sup> A European study<sup>[14]</sup> enlisted various causes of anemia in elderly with nutritional deficiencies and physical impairment being the major causes. A Chinese study celebrated a decrease in overall prevalence in anemia but still had a higher number of anemic elders.<sup>[15]</sup>

Mild anemia was prevalent overall and in all age groups which are similar to the outcomes of Peshawar study,<sup>[6]</sup> an Indian study<sup>[16]</sup> and an Italian one on elderly.<sup>[12]</sup> In contrast, an American study states that moderate to severe anemia rose with age.<sup>[13]</sup> The males having predominantly moderate anemia while in women mild and moderate both being common is contradicting to what Shahab found in Peshawar<sup>[6]</sup> and in the Indian study.<sup>[16]</sup> This severity of anemia is a grave situation and demands imperative address to its causes and factors. Mild anemia points again to the issue of nutritional deficiencies and such individuals are at a danger of not being investigated and managed which would eventually worsen leading to morbidity and diminished immunological responses, compromised physical activity, poor cognitive function and increased tendency to falls and fractures.

The prevalence of microcytic anemia overall and in females emphasized iron deficiency as one major culprit of anemia which is also reinforced by Mehmood.<sup>[17]</sup> Majority of people in Pakistan have bread (chapatti) and tea as their staple diet. These foods contain phytase and tenin which are inhibitors of iron absorption. The intake of red meat is lacking in the majority of the people. However, the normocytic anemia dominance in males attributes to their high probability of addiction, gastritis, and infections. The macrocytic anemia is now frequently seen in young males with betelnut addiction warranting future studies in this aspect. Our findings correlate to Uria's vast study in India.<sup>[18]</sup> Microcytic anemia in the young and middle group again point to nutritional deficiencies and fad diet. Tahir emphasizes on the prevalence of iron deficiency in young girls.<sup>[19]</sup> Chronic illness, gastropathies and multiple combined nutritional deficiencies contribute to the normocytic anemia in the elderly which is confirmed by Mauro<sup>[12]</sup> and Sgnaolin.<sup>[20]</sup>

Bengalis and Sindhis have the highest number of anemics which could be due to their unbalanced diet lacking red meat which is stressed by Faruk in his study on anemia in Bangladesh.<sup>[21]</sup> Urdu speaking, apart from an unbalanced diet and tendency to junk food because of living in the urban areas, are inclined to betel nut and gutka addiction. Pashtun's addiction to Niswar and tendency to hemorrhoids leads to a high anemic frequency confirmed by the study in Peshawar.<sup>[6]</sup> The lower anemic rate in Gilgits in both the genders is attributable to their higher literacy rate and awareness and availability of appropriate nutrition which is agreed upon by Uzma's data on anemia on female Gilgits.<sup>[22]</sup> The National survey of Pakistan, 2011 reported that only 24% of women in Pakistan had knowledge about iron

which was slightly higher in the urban areas. This understanding was more in Punjab and Sindh and less in Baluchistan and Peshawar.<sup>[23]</sup> It also showed that women of Sindh are most anemic. However in our study there was not much difference in the frequency of anemia in the genders of the ethnic groups except in Balouchis and Punjabis where the females were much more anemic than the males.

Both Muslims and Christians having similar percentage of anemia show that there are general common factors causing anemia which are not affected by religious affiliations. However, the Hindus having macrocytic anemia stressed the need of multivitamins in their vegetarian diet. Milan disagreed that there is any difference in anemia prevalence in view of religion.<sup>[24]</sup>

Smokers generally have polycythemia due to the secondary physiological response to poor oxidation by an increase release of erythropoietin but having the presence of anemia despite this response is a grave sign showed by the high percentage in our study. There are other more overpowering factors that are lowering the hemoglobin levels such as malnutrition, gastritis, chronic respiratory infections<sup>[25]</sup> and malignancy.<sup>[26]</sup>

Anemia is long notorious to be a sequel of diabetes due to numerous reasons with nephropathy being the foremost as pointed out by Shams<sup>[27]</sup> and several other studies.<sup>[28]</sup> Anemia worsens the glomerular filtration rate in diabetics and is a cardiovascular risk factor for them.<sup>[29]</sup> Hence, the correction of anemia is paramount in diabetics.

This survey confirmed the still high prevalence of anemia which is an eye opener and a reminder that its eradication is still an uncompleted task. It is an indicator of the nation's poor health and inappropriate nutrition which then leads to the functional decline of a society affecting the economic growth of a country. Widespread national nutrition programs are essential to control micronutrients deficiencies by health education at school level and health awareness at public and education sectors, and food fortification in food industries. It should be a community effort with the media playing a key role. Public health strategies should focus on hygienic living, regular health checkups, dietary diversity, balance diet, food iron and folic acid fortification and supplements. Food fortification is the most effective way to supplement nutrients in food which has been implemented successfully in Europe and United States where iron fortification in flour has reduced anemia prevalence to one third.<sup>[15]</sup> Hence, anemia still continues to be an ongoing challenge.

## CONCLUSION

Anemia is still highly prevalent in Pakistan and needs urgent and extensive action to decrease its prevalence.

## ETHICAL APPROVAL

The research protocol was approved by the institution's review board and ethical committee.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## LIMITATIONS OF THE STUDY

It was a hospital based study but a wider scale study should be done on a community basis. We investigated patients presenting to the hospital for the frequency of anemia in the population which could have led to an overestimation of the frequency of anemia. However, we excluded admitted patients. Limitations of our study also include an inability to know for certain whether patients had underlying occult hemoglobinopathy or X-linked G6PDH disorders which are known causes of anemia.

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