Original Research Article

The variation in anaemic parameters in the ethnic groups of Pakistan

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ABSTRACT

Aims: To observe any diversity of pattern in the anaemic parameters in the major ethnic groups of Pakistan. **Study design:** Observational, cross-sectional. **Place and Duration of Study:** Department of Medicine, Creek general Hospital, Korangi, Karachi, Pakistan from October 2017 to March 2018. **Methodology:** 1200 adults above 18 years were included. Pregnant females, age less than 18 years, any severe organ insufficiency, stroke, neurodegenerative disease, known blood dyscrasias or terminal illness at baseline evaluation were excluded. Their ethnic background was grouped into Urdu speaking, Punjabi, Baluchi, Sindhi, Pashtun, Bengali, and Gilgit according to their place of origin, mother tongue or parents' place of origin. The complete blood picture was performed to identify anemia, grade the severity, classify the red cell indices and exclude any blood dyscrasias in each of the ethnic group. **Results:** Out of 1200 adults, 626(52%) were anaemic. In decreasing order, the most anaemic were Bengalis (57.6%), Sindhis (55%), Urdu speaking (54%), Pashtuns (54%), Baluchis (52%), Gilgits (49%) and Punjabis (45%). In males, Sindhis (60%), Pashtuns (57%), Bengalis (56%), and Urdu speaking (51%) were most anaemic. In females, Baluchis (71%), Bengalis (64%), Urdu speaking (55%) were most anemic. Anaemia was prevalent in the younger age group of the Urdu speaking, Pashtun and Sindhis community, while in the rest of the ethnic groups anemia was most common in the middle age group. In males, anemia was highest in the young age group of Urdu Speaking, Sindhis, and Pashtuns while in females in all the ethnic groups the middle age group was most anemic and had least anemia in elderly females except in Bengalis where the least was in young females. Mild anemia was most common overall and in both genders. Regarding red cell indices, Punjabis and Bengalis were normocytic while in the rest the most were microcytic. In the males, Urdu speakers, Punjabis and Bengalis were significantly more normocytic anemic, while Sindhis were more microcytic. In females, in all the ethnic groups' microcytic anemia was prevalent. Anaemia was three times more in the Sindhi group of smokers compared to the Sindhi nonsmokers while in the rest of the ethnic groups there was no specific correlation. **Conclusion:** This survey specifies that in Pakistan the key measures of health status are albeit dependent on the financial status, literacy rate, sanitation, access to primary care facilities, effective role of health providers but the genetic composition and cultural norms also play their part.

1. INTRODUCTION

Anaemia persists to be a primary universal health concern with a global prevalence of 33% as stated in 2010[1]].The world health organization (who) estimated approximately 1.62 billion people of the world to be anaemic [2]. Pakistan is foremost in this concern as more than half of its population is anemic leading to a deterioration of mental and physical growth, subsequently affecting its economic progress. Its identification, correction and prevention being an urgent priority should be the key focus in the domain of health of this country. [3]

Anaemia is a multidimensional disease with both nutritional and non-nutritional etiologies being responsible such as iron, folate or cobalamin deficiencies, chronic or acute blood loss, inherited genetic defects, chronic diseases and/or inflammatory disorder, parasitic infestations, etc. [4]

Genomics is linked to public health science as population genetics and the epidemiology of a disease is found to be associated under a certain pattern which then affects the clinical practice of that population [5.6] this health inequality between ethnic groups are seen due to a number of reasons like reluctance in accessing healthcare, language and cultural barriers, certain myths and religious views, gender discrimination, poverty or underprivileged sectors. [7] Understanding the health

physiognomies of each group can enable us to prioritize screening programs, education and resource allocation according to their need.

Pakistan has several ethnic communities personalized by their culture and language according to their place of origin [8]. This Karachi based study is to observe any difference in the pattern of anemia and its extended parameters with respect to the ethnic groups in adults. It is to probe whether any genetic inborn structure or any cultural norms of a certain ethnic group would stand out as a specific culprit leading to anemia. An insight into these health inequalities with respect to ethnicity is needed for effective healthcare to be delivered appropriately.

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

The study was a cross sectional, observational one conducted in the outpatient clinic of a tertiary care hospital, Creek General Hospital, Korangi, Karachi from October 2017 to March 2018. The hospital is located in a multi ethnic area where strata from different ethnic backgrounds present to the clinics. It was done on 1200 adults (age 18 years and above) selected by convenient sampling. 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. The ethnic background was noted and grouped into Urdu speaking, Punjabi, Baluchi, Sindhi, Pashtun, Bengali, and Gilgit according to place of origin, mother tongue or parents' place of origin. Other relevant information was obtained. The complete blood picture (CBC) was performed by ABX Micros 60 Hematology Analyzer to identify anemia, grade the severity, classify the red cell indices by Mean Corpuscular Volume (MCV) and exclude any blood dyscrasias or acute hemolytic conditions. The data was analyzed on SPSS version 22 with the universal and dependent variables, quantitative and descriptive, analyzed in each group. Mean hemoglobin with standard deviation and Range tabulated for each ethnic group. Linear regression was done for hemoglobin and parity.

Objective Definitions;

Anemia (WHO Criteria) [9]

Hemoglobin levels; Males :< 13 g/dl Females: <12 g/dl

Severity of anaemia

	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 Classification of anemia: Normocytic; 84-96fl   Microcytic ;< 84fl   Macrocytic >96fl

Age groups

Young;18-30 years   Middle age group;31-50 years Elderly group; >50 years

3. RESULTS

Among the 1200 adults that presented 631(52.6%) were Urdu Speaking, 250(20.8%) were Punjabis, 92(7.7%) were Sindhis, 80(6.7%) were Pashtuns, 71(6%) were Gilgits, 52(4.3%) were Bengalis, and 24(2%) were Balochis. Out of the 626(52%) were anaemic. The frequency of anaemia in each ethnic group and the gender distribution of anemia in each group are demonstrated in table 1. The mean hemoglobin (with std deviation and range) of each ethnic group is shown in table 2.The percentage of anaemia in the ethnic groups according to age groups is displayed in figure 1.the severity of anemia in the various ethnic groups is presented in figure 2. The frequency of anemia with respect to age groups in males is displayed in figure 3. In females, the anaemia percentage was highest in the middle age group in all the ethnic groups and least in the elderly group of all ethnicities except the Bengalis where the young females had least anaemia (P= 0.12). Mild anaemia was more common in male gender of all groups (P=.743) and in the female gender (P=.090) when severity was checked separately in each gender. The red cell indices in the different ethnic groups are tabularized in table 3. When analyzed gender wise; in the males - Urdu speakers, Punjabis and Bengalis were significantly more normocytic anaemic, while Sindhis were more microcytic. The Balochis, Pashtuns, and Gilgits were equally more normocytic and microcytic than macrocytic. (P= .884) in females, in all the ethnic groups' microcytic anemia was more prevalent. There is no specific correlation or pattern of variation of anemia with the number of children in the females in any of the ethnic groups. Anaemia was three times more in the Sindhi group of smokers compared to the Sindhi nonsmokers while in the rest of the ethnic groups there was no specific correlation on linear regression. There was no specific ethnic group in which diabetics had significantly more anemia compared to non-diabetics of that group.

Table I: Anaemia in different ethnic groups and with respect to gender in that ethnic group

(P=0.282)

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(54 %)	35	19(54%)	45	24(53%)
Baluchis	24	12(52%)	10	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%)

Table 2: Mean hemoglobin found in all the groups

| ethinicity	Mean	Std. Deviation	Range
Urdu Speaking	11.93	3.84	89.00
Punjabi	12.59	6.47	104.50
Sindhi	11.62	2.09	10.30
Bengali	12.04	2.16	11.00
Gilgit	12.02	1.87	9.20
Balouchi	11.86	2.45	8.80
Pashtun	12.22	2.42	14.60
Total	12.07	4.21	107.00

Table 3: The frequency of red cell indices in ethnic groups(P= .197)

Ethinicity	MCV group			Total anemic in that group
	Normocytic (% of total anemic of that group)	microcytic<84(% of total anemic of that group)	macrocytic>96(% of total anemic of that group)	
Urdu Speaking	140(41)	182(53)	19(5)	341
Punjabi	55(48)	53(46)	6(5)	114
Sindhi	17(33)	31(60)	3(5)	51

Bengali	16(53)	13(43)	1(3)	30
Gilgit	14(46)	17(48.5)	4(11)	35
Balouchi	2(16)	10(83)	0	12
Pushto	12(27)	29(67)	2(4)	43
Total	256	335	35	626

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94   Figure 1 The anaemic distribution in the ethnic groups according to age group
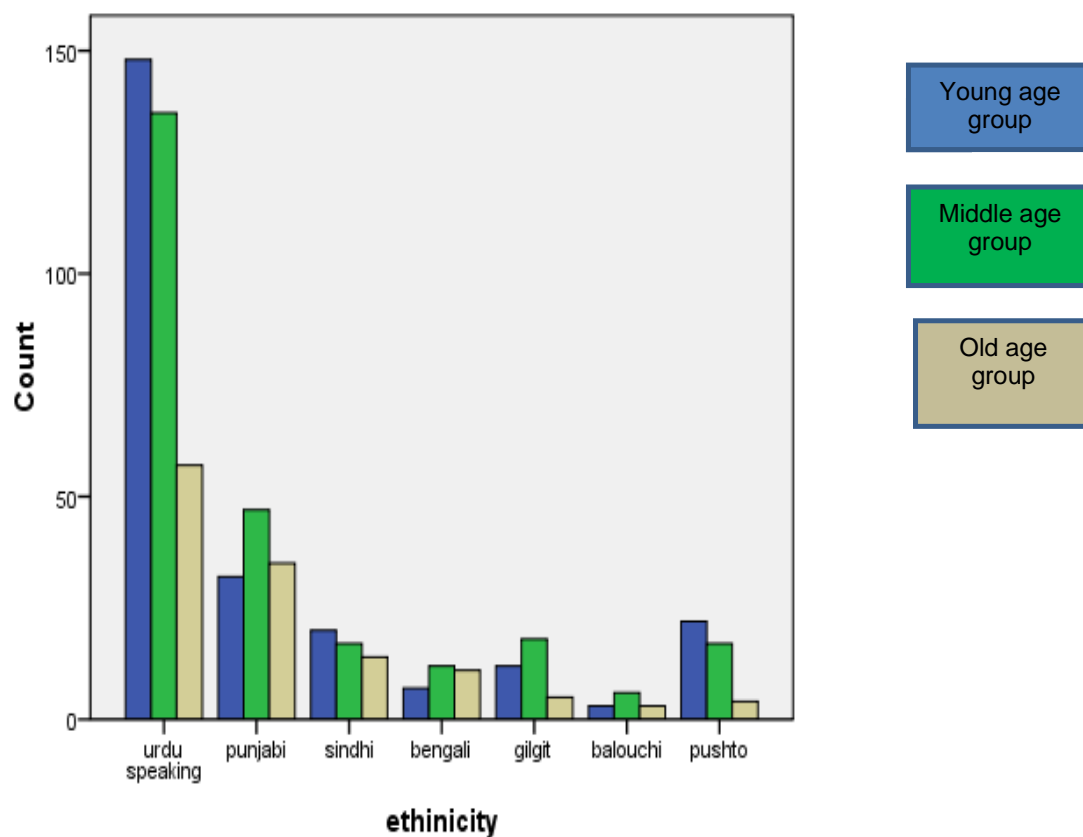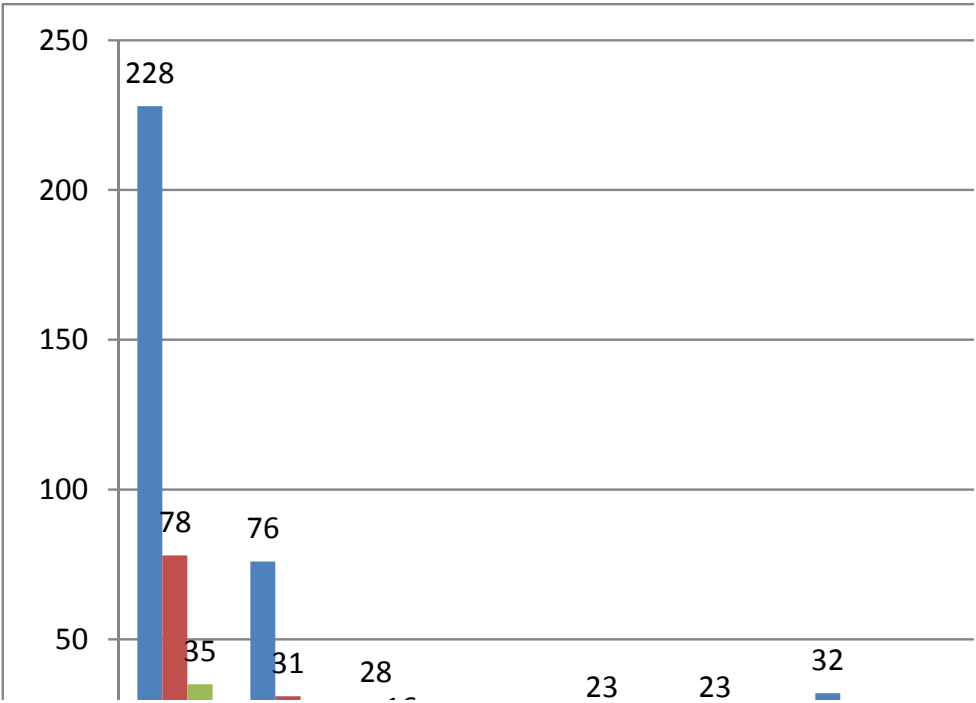

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102   Figure 2   The severity of anaemia in different ethnic groups (*P*= .856)

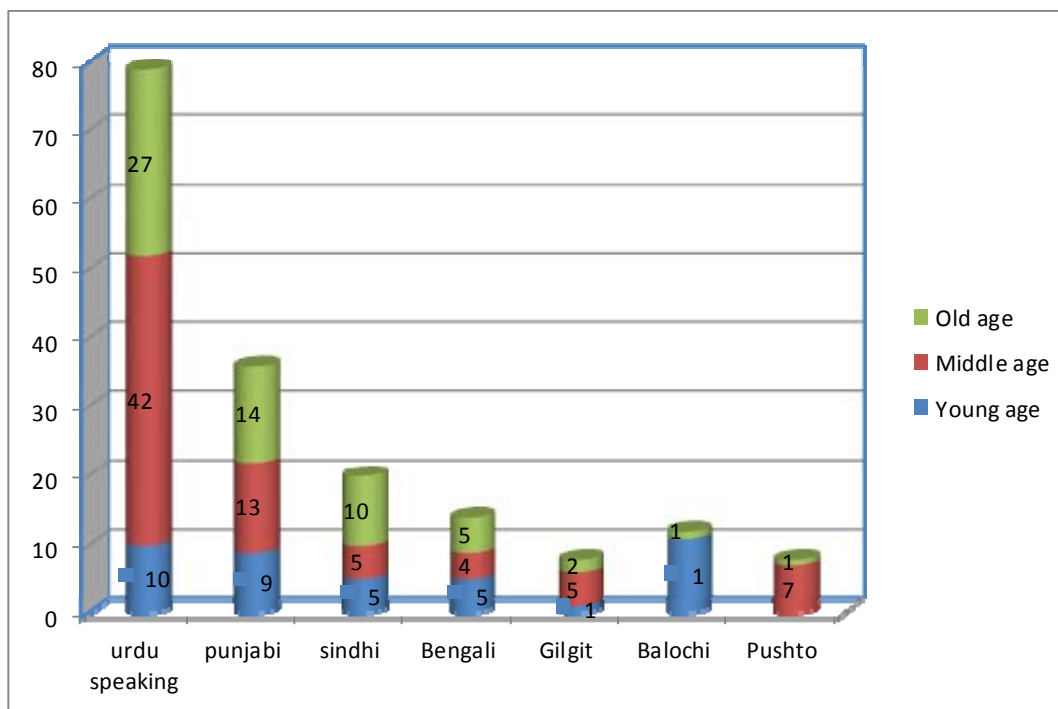103

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121   Figure 3   The pattern of anaemia frequency according to age groups in the males of

122   the different ethnic groups (P= .164)

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DISCUSSION

126   Ethnicity influences the parameters of a disease by and large factors such as differences in service
127 availability, geographical origin, communication and language obstacles, cultural attitudes/beliefs,
128 socio-economic status, and genetic differences in disease prevalence. We analyzed the anemic
129 parameters of each ethnic group residing in Karachi and then compared the statistics with the adults
130 of that group living at their place of origin. The severity of anemia was by large mild in all groups and
131 genders giving a hope that the risk factors if effectively attended to would minimize the prevalence of
132 anemia in Pakistan.

133   Bengalis had the highest frequency of anemia in this cohort and the equal prevalence in both
134 genders points to certain common factors that are contributing to anemia in the whole population. The
135 Bengalis of Karachi are mainly involved in the fishing industry living near the coastal areas in
136 unhygienic and poor conditions. [10] Their diet mainly consists of rice, lentils and fish which lack iron
137 and other micronutrients. This lack of red meat in their diet was also stressed upon by Faruk in his
138 Bangladeshi study [11]. Males had mostly normocytic anemia probably because of the mixed
139 nutritional deficiencies (of iron and cobalamin) and prevalence of chronic diseases. The females are
140 microcytic understandably due to their hormonal cycles, multiple pregnancies and malnutrition with
141 inadequate iron intake compared to the loss which is why the middle age groups were worst affected.
142 Bharti [12] studied anemia in West Bengal and noted that it was prevalent in all socioeconomic group
143 of females and Merrill insisted that females are subject to gender biasness in diet availability [13].
144 Factors, present in Bengalis of Karachi, common to both genders are a parasitic infestation, daily diet
145 lacking folate and iron, unhygienic conditions, poverty and food contamination by sea pollutants which
146 was seen more in the middle and elderly age group.

147   A conspicuous result in Sindhis which was an eye opener was the higher frequency of anemia in
148 males compared to females with both the genders being microcytic. A probable conclusion is that
149 dietary iron deficiency, hookworm manifestation, acid peptic disease and smoking are the main
150 anemic culprits here (after we exclude blood dyscrasias). The addiction profile was very high in Sindhi
151 males and anemia being three times more in smokers than nonsmokers' glares at the consequences
152 of gutka and tobacco and explains why the young males are more anemic than other age groups of
153 Sindhis. The growing use of gutka and other forms of tobacco results in severe malnutrition as these

154 noxious products suppress appetite and prevent absorption of micronutrients in the body. This low
155 hemoglobin is present despite the secondary physiological erythropoietin response caused by
156 tobacco. The statistics of Sindhi women health has also worsened. The results of the NNS 2011 for
157 anemia showed that the prevalence of anemia in non-pregnant females had risen from 28% in 2001
158 to 50% in 2011 [14, 15]. Cultural myths, lack of approach to healthcare, ineffective counseling by
159 health care providers, multiple pregnancies and addiction to 'beeri'(raw tobacco) is causing a serious
160 setback in decreasing the rising ratio of women with malnutrition which takes its toll in the middle age
161 group females. Laghari [16] studied anemia in students of Sindh University, Jamshoro and his studies
162 showed females to be more anemic compared to males which is unlike our ratio of the Sindhis
163 presiding in Karachi.

164 The Urdu speaking community is primarily an urban population and their exposure and tendency
165 towards Fad diets and unhealthy junk food which then causes acid peptic disease as a sequel is
166 comparatively more compared to other communities. Their high percentage of addiction to gutka and
167 betel nut has led to high prevalence of anemia in young males. Bharati [12] has already emphasized
168 that there is a high anemic frequency in India with factors more or less common to both sides of the
169 country borders. The females suffer more due to the gender discrimination, unequal food sharing and
170 child bearing leading to the middle age group being most anemic and the elderly females having
171 attained menopause are the least anemic.

172 The Pashtuns of Karachi are physically strong and involved in strenuous physical occupational work
173 yet more than half of them were found to be anemic. One of the prevailing offenders of the high
174 anemic prevalence in young males is the rampant Niswar addiction. There is also suspicion of high
175 frequency of constipation leading to hemorrhoids in Pashtuns (but studies are needed to confirm this)
176 which could be the cause of microcytic anemia in them. Shahab's study [17] conducted in Peshawar
177 agreed to our results which shows that there are common correctable propensities in both genders of
178 the community.

179 The Balochis that presented here were mostly those living in the coastal areas and are fisherman by
180 profession. They catch trade and eat fish. This then leads to another important factor of sea pollution
181 which is the toxic effect of the minerals consumed by the fish which eventually is transferred to the
182 fish consumers. This sea pollution is taking a heavy toll on human health. There is a also a high
183 addiction rate of 'tiryak' (finer opioid). The women were triple times more anemic then men and when
184 we compared this to the Balochis living in Baluchistan the statistics were similar for women. In
185 Baluchistan, poverty and unemployment coupled with worsening law and order situation have
186 deepened woes and severely affected the nutritional status of women [18]. However, a common
187 factor in most Balochi women, whether urban or rural, was the issue of multiple pregnancies, low adult
188 literacy rate and conservative restricted living. [19] According to National Nutrition Survey (NNS)
189 conducted in 2011, the anemic statistics of Baluchistan jumped from 26.9 to 49 per cent in 2011 with
190 higher prevalence of anemia in females and the knowledge of micronutrients being least in
191 Balochis.[14].

192 Half of the Gilgits of Karachi were anemic which is a higher rate compared to the natives living in the
193 Gilgit Baltistan. One obvious reason of the natives to be less anemic is the high altitude in the
194 Northern region of Baltistan which causes secondary polycythemia masking anemia if it is internally
195 present. Karachi is a low lying area which would alienate the erythropoietin effect. Uzma [20] stressed
196 in her study on anemia in Gilgit that the anemia frequency is lower because of higher literacy rate in
197 the region due to a well-established system of basic education. Inference can be drawn from this fact
198 that educational status of women has a major impact in solving this problem. Khalil [21] showed that
199 there is a high prevalence of intestinal infestations especially Ascaris Lumbricoides among Gilgits
200 which can then be a factor causing anemia even if they migrated to Karachi. The highest percentage
201 of macrocytic anemia was in Gilgit group showing cobalamin/folic acid deficiency to be a contributing
202 factor which is assured by Tanweer in his Karachi based study on macrocytic anemia. [22] This needs
203 to be explored in further studies to rule out any genetic intrinsic factor anomalies.

204 Punjabis residing in Karachi had the lowest percentage of anemia in this study cohort showing them
205 to be nutritionally balanced. Females were considerably more anemic, and a microcytic one, due to
206 their physiological processes along with being in a male privileged society. According to the NNS
207 2011 report the knowledge of micronutrients was the highest in Punjab area [14] which again
208 emphasizes the deep impact education has in the development of healthcare. Middle age group of

males are the working class and the revenue generator and they being normocytic anemic means that we need to reinforce awareness of diet and health checkups in them.

Limitations of Study;

It was a hospital-based study and a larger scale research should be done in the community. There could have been an overestimation of the frequency of anemia since it was a hospital sampling. There was also an inability to know for certain whether patients had underlying occult hemoglobinopathy or X-linked G6PDH disorder which is known causes for anemia here. Some the ethnic group had a low sample size. Further studies are warranted in each ethnic group to investigate each of the variables separately.

4. CONCLUSION

This survey suggests that in Pakistan the key measures of health status are albeit dependent on the financial status, literacy rate, sanitation, access to primary care facilities, effective role of health providers but the genetic composition and cultural norms also play their part. It is important to try to understand where and how ethnic differences impacts on healthcare delivery if health inequalities are to be reduced across the whole population. Evidence suggests that the poorer socio-economic position of some ethnic groups is the main driver and aggravator of ethnic health inequalities.
Pakistan needs a more comprehensive strategy to prevent loosing 'working years' from anemia by focusing on practically implemented, home based interventions that include diet counselling, micronutrient supplementation, food fortification to attend to nutritional anemia while concomitantly responding to other etiologies of anemia. Hygiene and sanitation, deworming. Malaria prevention is other areas of necessary interposition. Health policies are required to tackle health inequalities keeping the ethnic variations in mind. Callen's review [23] on healthcare facility of Punjab points to a necessity for improvement in the role and availability of healthcare officers at Basic Health unit level in the whole country who can then tackle issues at a local ground level. Specific health messages through electronic media can promote the importance of a healthy, prestigious woman in the family. Woman employment and family planning programs should be stressed [26] to relieve the misery of poverty. Further extended studies should be conducted to probe into each of the variables (cultural, social, genetic composition, education) in detail in each individual ethnic group

CONSENT

"All authors declare that 'written informed consent was obtained from the patient. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal."

ETHICAL APPROVAL

"All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki." The ethics committee is that of the Research department of the Creek General Hospital and UMDC.

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