Anaemia during pregnancy is a global problem affecting almost half of pregnant women. The WHO regions of Africa and South-East Asia have the highest risk\(^1\). Anaemia prevalence during pregnancy differed from 18% in developed countries to 75% in South-Asia\(^2\). The world health organization defines anaemia in pregnancy as haemoglobin concentration less than 11g/dl and a haematocrit below 33%\(^3\). It is further categorized according to severity into mild (9-10.9g/dl), moderate (7-8.9g/dl) and severe (<7g/dl) degree of anaemia. The complications increase with increasing severity.

Anaemia during pregnancy is associated with increased maternal morbidity and mortality. In India anaemia is directly or indirectly responsible for 40% of maternal deaths. There is 8-10 fold increase in maternal mortality rate when haemoglobin falls below 5g/dl\(^4\). Death from anaemia is the result of heart failure, shock or infection. Anaemic women do not tolerate the blood loss to same degree as healthy women\(^5\).

Maternal anaemia is associated with increased risk of adverse perinatal outcomes such as foetal anaemia, low birth weight, preterm birth and still-birth\(^6\)\(^1\)\(^1\). Neonatal effects include low iron stores, poor cognitive development and low IQ.

The etiological factors for anaemia vary geographically. Nutritionally related iron deficiency is the main cause of anaemia throughout the world\(^7\). Besides poor nutrition frequent child birth with close birth spacing, abortions, low educational status, late booking, poor socioeconomic status, parasitic infections and pica have been described as factors contributing to anaemia in pregnancy in various studies\(^2\)\(^1\)\(^2\)\(^1\)\(^3\)\(^1\)\(^4\).

The management and control of anaemia in pregnancy can be enhanced by the availability of local prevalence statistics. This is the first study conducted in district Gujrat, aiming to determine the prevalence and various risk factors associated with maternal anaemia at the booking visit in Aziz Bhatti Shaheed teaching hospital.
The findings could be useful for the health policy makers, clinicians and other health care providers towards reducing the frequency of anaemia and its related complications.

MATERIALS AND METHODS
This was a descriptive study carried out at Aziz Bhatti Shaheed (DHQ) teaching Hospital Gujrat. It is a 322 bedded hospital established in 1963 and declared as teaching hospital in 2008 after establishment of Nawaz Sharif Medical College. It is the main referral hospital of district Gujrat which has a total population of 2.4 million.

A total of 560 patients who attended the antenatal clinic for booking from 1st Jan 2012 to July 31st 2012 were included in the study. Informed consent was obtained prior to commencement of interview. A detailed questionnaire was filled by the attending doctor during patient history taking. Gestational age was calculated from the date of last menstrual period and in patients who were unsure of dates symphysiofundal height or ultrasound scan was used for estimation of gestational age. Blood samples were taken for complete blood counts at the same visit. Patients with multiple pregnancies, those who were booked somewhere else and referred due to some complication or who refused investigation at first visit were excluded from the study.

Anaemia was labeled when haemoglobin was <11g/dl and was further categorized as mild (Hb=9-10.9g/dl), moderate (Hb=7-8.9g/dl) and severe (Hb<7g/dl) degree. Stool and urine examinations were done where indicated. Further investigations like haemoglobin electrophoresis, serum ferritin, serum iron and TIBC were done in few cases only due to non-affordability of patients.

Statistical analysis was performed using the computer software Statistical Package for social Sciences (SPSS) for windows version 16. Statistical significance was set at p value <0.05.

RESULTS
Out of 987 pregnant women seen in outpatient department 560 women fulfilled the inclusion criteria. Among these 141 women were non-anaemic and 419 were anaemic giving a 74.8% prevalence of anaemia. The mean age of anaemic and non-anaemic women was 27.6yr and 25.6 year respectively. A total of 189(33.7%) primi-gravidae and 371(66.2%) multi-gravidae were enrolled in the study. Anaemia was present in 131 primi-gravidae and 288 multi-gravidae giving a prevalence of 69.3% and 77.6% in primi-gravidae and multi-gravidae respectively (p=0.032). (Table-I).

Table II shows that among the anaemic women prevalence of mild, moderate and severe anaemia was 69.9%, 26.7% and 3.3% respectively .Majority of primigravidae (75%) had mild anaemia as compared to multigravidae (67.7%),showing an increased severity of anaemia in multigravidae (p=0.028) No case of severe anaemia was noted in primigravidae. The anaemia was more prevalent in those women who had birth interval <1year (84.7%) or between 1-<2years (85.7%) compared to those who had birth interval of 2-<3years(68.8%) or >3years(66.1%) showing an inverse relationship that was statistically significant (P=.001) (Table-I).

A higher number 345(61.6%) of women registered for antenatal care in 3rd trimester compared to 72(12.8%) in 1st and 143(25.5%) in 2nd trimester .Prevalence of anaemia was44 (61.1%), 101 (70.6%) and 274 (79.4%) in those who were booked in 1st, 2nd and 3rd trimesters, reflecting an increased prevalence with late booking (p=0.002). (Table-I)

Regarding education status out of 560 women 305 (54.46%) had no formal education, 187 (33.4%) and 68(12.40%), were educated up to primary and secondary school and higher secondary school. The
anaemia was higher among those who were uneducated 240 (78.6%) or educated up to primary 135 (72.2%). The difference was statistically significant (p = 0.033) (Table-I).

The factors studied other than these sociodemographic factors were dietary habits regarding frequency of intake of chicken/meat, pica and history of blood loss (menorrhagia, haemorrhoid, antepartum haemorrhage and postpartum haemorrhage). (table-III) overall 309(55.2%) women took meat ≥2 times per week. The anaemia was more prevalent in those who took chicken/meat <2 times per week 201 (80%) than those who took it ≥2 times per week 218 (70.6%). (p = 0.01). There was history of pica intake in 128(22.8%) women, 108(19.2%)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Non-anaemic</th>
<th>Anaemic</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primigravidae</td>
<td>58 (30.6%)</td>
<td>131 (69.3%)</td>
<td>189 (100%)</td>
<td>0.032</td>
</tr>
<tr>
<td>Multigravidae</td>
<td>83 (22.4%)</td>
<td>288 (77.6%)</td>
<td>371 (100%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>141 (25.2%)</td>
<td>419 (74.8%)</td>
<td>560 (100%)</td>
<td></td>
</tr>
<tr>
<td>Gestational age at booking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st trimester</td>
<td>28 (38.9%)</td>
<td>44 (61.1%)</td>
<td>72 (100%)</td>
<td>0.002</td>
</tr>
<tr>
<td>2nd trimester</td>
<td>42 (29.45%)</td>
<td>101 (70.6%)</td>
<td>143 (100%)</td>
<td></td>
</tr>
<tr>
<td>3rd trimester</td>
<td>71 (20.6%)</td>
<td>274 (79.4%)</td>
<td>345 (100%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>141 (25.2%)</td>
<td>419 (74.8%)</td>
<td>560 (100%)</td>
<td></td>
</tr>
<tr>
<td>Birth interval</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 yr</td>
<td>9 (15.3%)</td>
<td>50 (84.7%)</td>
<td>59 (100%)</td>
<td>0.001</td>
</tr>
<tr>
<td>1 - &lt;2 yr</td>
<td>21 (14.3%)</td>
<td>126 (85.7%)</td>
<td>147 (100%)</td>
<td></td>
</tr>
<tr>
<td>2 - &lt;3 yr</td>
<td>34 (31.2%)</td>
<td>75 (68.8%)</td>
<td>109 (100%)</td>
<td></td>
</tr>
<tr>
<td>≥ 3 yr</td>
<td>19 (33.9%)</td>
<td>37 (66.1%)</td>
<td>56 (100%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>83 (22.4%)</td>
<td>288 (77.6%)</td>
<td>371 (100%)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>65 (21.3%)</td>
<td>240 (78.6%)</td>
<td>305 (100%)</td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>52 (27.8%)</td>
<td>135 (72.2%)</td>
<td>187 (100%)</td>
<td></td>
</tr>
<tr>
<td>Secondary and High secondary school</td>
<td>24 (35.3%)</td>
<td>44 (64.7%)</td>
<td>68 (100%)</td>
<td>0.033</td>
</tr>
<tr>
<td>Total</td>
<td>141 (25.2%)</td>
<td>419 (74.8%)</td>
<td>560 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Table-I. Prevalence of anaemia in pregnancy by maternal characteristics
anaemic and 20 (3.6%) non-anaemic (p=0.005). (table-III). History of blood loss was present in 66 (11.7%) women, 53 (9.5%) were anaemic and 13 (2.3%) were non-anaemic, but the difference was not statistically significant (p=0.275).

DISCUSSION
The high prevalence of anaemia (74.8%) revealed in this study is pin indication that anaemia during pregnancy is a major health problem in district Gujrat. Baig-Ansari N and Rohra DK have also shown a high prevalence (91%) of anaemia in their studies at Hyderabad, Karachi and Nawab Shah\textsuperscript{10,15}. In contrast study of Ayub R at shifa International Hospital Islamabad has shown that 42.5% pregnant women were anaemic\textsuperscript{16}. The difference may be because that study was conducted in capital city of Pakistan where the level of awareness and education of antenatal clinic attendees varies. A similar high rate of 76.5% of anaemia was found in a study by Idowu OA in Nigeria at booking visit\textsuperscript{17}.

Anaemia in majority (70%) of our women was mild while only 3.3% had severe anaemia. WHO also reports an expected range of 1-5% of severe anaemia\textsuperscript{18}. Study of Baig-Ansari has also shown that

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|c|}
\hline
Gravida & Mild & Moderate & Severe & Total & P-value \\
\hline
Primigravidae & 98 (75%) & 33 (25%) & - & 131 (100%) & 0.028 \\
Multigravidae & 195 (67.7%) & 79 (27.4%) & 14 (4.8%) & 288 (100%) & \\
Total & 293 (69.9%) & 112 (26.7%) & 14 (3.3%) & 419 (100%) & \\
\hline
\end{tabular}
\caption{Comparison of severity of anaemia between primigravidae and multigravidae}
\end{table}

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|}
\hline
Risk factor & Non-anaemic & Anaemic & Total & P-value \\
\hline
Intake meat or chicken & & & & 0.01 \\
\geq 2 Times / Wk & 91 (29.4%) & 218 (70.6%) & 309 (100%) & \\
< 2 Times / Wk & 50 (19.9%) & 201 (80.1%) & 251 (100%) & \\
Total & 141 (25.2%) & 419 (74.8%) & 560 (100%) & 0.005 \\
Pica & & & & \\
Yes & 20 (15.6%) & 108 (84.4%) & 128 (100%) & \\
No & 121 (28%) & 311 (72%) & 432 (100%) & \\
Total & 141 (25.2%) & 419 (74.8%) & 560 (100%) & \\
History of blood loss & & & & \\
Yes & 13 (19.7%) & 53 (80.3%) & 66 (100%) & 0.275 \\
No & 128 (26%) & 366 (64%) & 494 (100%) & \\
Total & 141 (25.2%) & 419 (74.8%) & 560 (100%) & \\
\hline
\end{tabular}
\caption{Relationship of frequency of meat intake, pica and blood loss with anaemia}
\end{table}
75% women had mild anaemia but incidence of severe anaemia in her study was only 0.7%. Nwizu EN had also noted no case of severe anaemia in Kano, Northern Nigeria.

Anaemia was more prevalent among multigravidae as compared to primigravidae. In another study anaemia frequency was highest in those with four or more live births. More cases of moderate to severe anaemia were observed in multigravidae than in primigravidae concurrent to findings of Uche-Nwachi EO at Trinidad and Tobago. Adequate birth spacing was also lacking in our women. Frequency of anaemic patients decreased from 84.7% to 66.1% with increasing birth interval from < 1 year to ≥ 3 years in our study. GN Okuwu has also shown that pregnant women with birth interval of <1year and 1-1.5 years has significantly lower mean Haemoglobin while parity did not effect prevalence of anaemia in his study. Prior births may deplete maternal iron stores due to increased nutritional requirement of pregnancy and puerperal blood loss. The short interval between pregnancies delays the mother's recovery from the effects of previous pregnancies thus increasing the risk of maternal depletion syndrome. Since the foetal requirements are met first the mother is left with further depleted iron stores and anaemia develops. It has been shown that exhausted maternal stores at the end of one pregnancy takes about 2 years to be replenished. Breast feeding further depletes the iron stores.

There was a trend of late booking among pregnant women. Total 61.6% were booked in 3rd trimester out of which 79.4% were anaemic. Late booking is recognized as a risk factor for anaemia in other studies as well. Late booking places the women and health care providers in a difficult situation due to limited time for optimum correction of any observed anaemia. The government and health care providers should use effective media to improve awareness of community about importance of early booking in pregnancy.

Only 45.6% of our pregnant women had any formal education and only 12.1% of them were educated above primary level. The anaemia prevalence of pregnant women decreased from 78.6% to 64.7% with increasing education level from no formal education to Matric and above. The finding is consistent with those of GN okuwu's study which showed a high prevalence of anaemia among the less educated women (no formal education and educated upto primary) (p<0.0136). The reason may be that educated women have better understanding of importance of balanced diet, hygiene and sanitation and thus have reduced risk of infections. They have more awareness of importance of birth spacing and the methods used for that.

The most common cause of anaemia in pregnancy is iron deficiency. Iron in the meat is in heme form, and is highly bioavailable so inadequate iron intake especially reduced access to heme iron can contribute to anaemia. Our study has shown a significant relationship of reduced frequency of intake of meat/chicken with increased risk of anaemia. Similarly a large survey in Vietnam had shown that meat consumption less than 3 times per week in women of reproductive age was associated with high prevalence of anaemia. Abbassi RM found nutritional deficiency in 76.4% of anaemic gravidas. Baig-Ansari N had also shown significant relationship of reduced frequency of meat intake and low mean haemoglobin concentration in pregnancy.

Pica, the craving and purposive consumption of substances that the consumer does not define as food, is a widespread phenomenon that has been documented in nearly all cultures. In our study 22.8% women gave history of pica (soil eating, raw rice, peanut shells), out of which 19.2% were anaemic, showing a strong relationship of anaemia with pica intake. In a study of Young SL pica was seen in 41.6% of patients and had a strong association with low mean haemoglobin concentration and iron deficiency.
anaemia.

We were unable to investigate other causes of anaemia like worm infestation and beta thalassemia in all anaemic cases due to non-compliance and non-affordability of majority of our patients. The incidence of beta thalassemia minor is around 5% in Pakistan and its carriers present with mild anaemia. Further studies are required for these factors.

CONCLUSIONS
Anaemia is a major health problem in pregnant women. High parity, lack of birth spacing, late booking, lack of education, low protein intake and unhealthy eating habits are all contributing factors. Health education will lead to increased awareness and utilization of antenatal care and family planning services. Women should be educated about importance of early booking, use of iron pills during pregnancy and healthy eating habits through mass media and health workers to improve the current situation. Husbands are very powerful in decision making process in our culture so they need to be educated on the importance of providing permission, support and actual involvement in maternal health care including antenatal care and family planning.


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