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A study on prevalence of sickle cell anemia in pregnant women (20-25 Years) in Wardha and Nagpur District

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Abstract
Sickle cell anemia is a genetically inherited disease caused by mutated version of the gene that helps make haemoglobin – a protein that carries oxygen in red blood cells. Sickle cell (HbSS) is a genetic disease. People who carry only one copy of the sickle cell gene do not have the disease, but may pass the gene on to their children. Sickle cell haemoglobin cells are sticky and form in to the shape of sickle, or the letter 'c' when they lose their oxygen. These sickle cells tend to cluster together and cannot easily move through the blood vessels. The cluster causes a blockage and stops the movement of healthy, normal oxygen-carrying blood. This blockage is what causes the painful and damaging complications of sickle cell disease. The ability of the blood cells to carry oxygen is especially important in pregnancy. The sickling and anaemia may result in lower amounts of oxygen going to the foetus and slowed foetal growth. In the present study sickle cell disease was found to be highly prevalent in the tribal population of Boudha Pardhans, Govaris and less prevalent in Banjaras, Gond, Matang etc Individuals from Wardha positive for SCA in study area belongs to 'boudha' caste 3.70%, and 3.34% individuals were from Nagpur.

Keywords: SCA, HbSS, mutated gene, sickling

Introduction
Sickle cell disease is an inherited blood disorder characterized by defective hemoglobin (a protein in red blood cells that carries oxygen to the tissue of the body). Sickle cell disease involves the red blood cells, or hemoglobin and their ability to carry oxygen. In Sickle cell anemia the child has most or all of the normal hemoglobin (HbA) replaced with the sickle hemoglobin (HbS). This is referred to as HbSS. It is the most common and most severe form of the sickle cell variations.

Sickle cell conditions are inherited from parents in much the same way as blood type, hair colour and texture, eye colour and other physical traits. The types of haemoglobin a person makes in the red blood cells depend upon what haemoglobin genes the person inherits from his or her parents. Like most genes, haemoglobin genes are inherited in two sets - one from each parent.

Sickle cell (HbSS) is a genetic disease. A person will be born with sickle cell disease only if two HbS genes are inherited - one from the mother and one from the father. A person who has only one HbS gene is healthy and said to be a "carrier" of the disease. They may also be described as having "sickle cell trait." A carrier has an increased chance to have a child with sickle cell disease. This type of inheritance is called "autosomal recessive."

Once parents have a child with sickle cell disease, there is a one in four or 25% chance with each subsequent pregnancy, for another child to be born with sickle cell disease. This means that there is a three out of four, or 75% chance, for another child to not have sickle cell disease. There is a 50% chance that a child will be born with sickle cell trait, like the parents.

So here an attempt is made to study the prevalence of sickle cell anaemia and proposed few suggestions and wish that the government acts on them soon.

All major organs are affected by sickle cell disease. The liver, heart, kidneys, gallstone, eyes, bones, and joints can suffer damage from the abnormal function of the sickle cells and their inability to flow through the small blood vessels correctly. Problems may include the following:

- Increased infections.
- Leg ulcers.
- Bone damage.
- Early gallstones.
- Kidney damage and loss of body water in the urine.
- Eye damage.

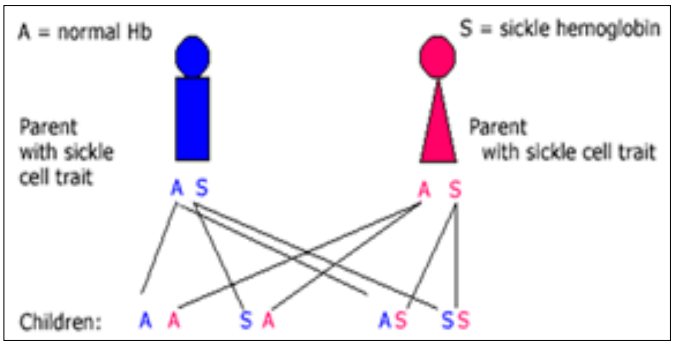

Fig 1: Genetically inheritance of sickle cell trait

Objectives of the study were as follows

- Survey will be carried out to find the sickle cell anemia unit in government hospital, PHC Nagpur and Wardha to investigate the case (investigation will be done with the help of physician)
- Survey will be carried out to find out if there is any sickle cell anemia unit in of the private hospital in Nagpur and Wardha.
- To examine the pregnant women visiting the centers for SCA with the help of hematologist.
- To examine hemoglobin status of the pregnant sickler and non-sickler women as well as sickler and non-sickler children.
- A comparative study of pregnant sickler and non-sickler women will be done to know the consequences/outcome of pregnancy.

Methodology

Selection of study area and research design

The present study has been undertaken in purposively selected Wardha and Nagpur district in Vidarbha region of Maharashtra State. The emphasis in the study was on prevalence of sickle cell anemia in pregnant women; hence an exploratory design of research was adopted in the present investigation.

Method of sampling and selection of sample

The study was related to the prevalence of sickle cell anemia in pregnant women hence for the purpose of study different villages of Wardha and Nagpur were considered. For the purpose of study a sample of 27 pregnant women from Wardha district and 30 pregnant women from Nagpur district in the age group of 20-25 years were taken as respondent from different villages.

Preparation of tools of data collection and collection of data

Clinical observation is a most essential part of an individual. The clinical observation included the examination of eyes, skin, lips, teeth, tongue, blood pressure etc. to find out symptoms of Sickle Cell Anemia**.** Biochemical Investigation was undertaken to ascertain Hemoglobin level of the sample and to study the prevalence of anemia due to deficiency of iron. In addition the Hemoglobin content in blood was recorded.

The collected data was tabulated and frequencies and Percentages in each class were worked out, proper statistical tests were used for interpretation and drawing results.

Results and Discussion

Caste wise distribution of individuals

Table 1: Caste wise distribution of individuals tested for prevalence of sickle cell anaemia

Caste	Frequency Wardha	Percent	Frequency Nagpur	Percent
Boudha	06	22.3	07	23.13
Banjara	02	7.40	03	10
Gowari	03	11.2	02	6.67
Gond	02	7.40	03	10
Kolam	01	3.70	01	3.34
Matang	01	3.70	01	3.34
Kunbi	02	7.40	02	6.67
Pradhan	02	7.40	02	6.67
Shimpi	02	7.40	03	10
Teli	02	7.40	02	6.67
Dhangar	02	7.40	01	3.34
Halaba	02	7.40	01	3.34
Komti			02	6.67
Thakur				
Open				
Total	27		30	

Table 1 Indicates distribution of individuals tested for SCA in study area on the basis of their caste. On the basis of information provided in the table majority of individuals belong to ‘boudha’ caste 22.3% & 23.3%, individuals from Banjara, Gond, Kunbi, Pradhan, Shimpi caste were recorded 7.40 & 6.67% Furthermore 3.70% & 3.34% individuals of Kolam,Matang caste were recorded in Wardha and Nagpur district respectively. (Figure 2)

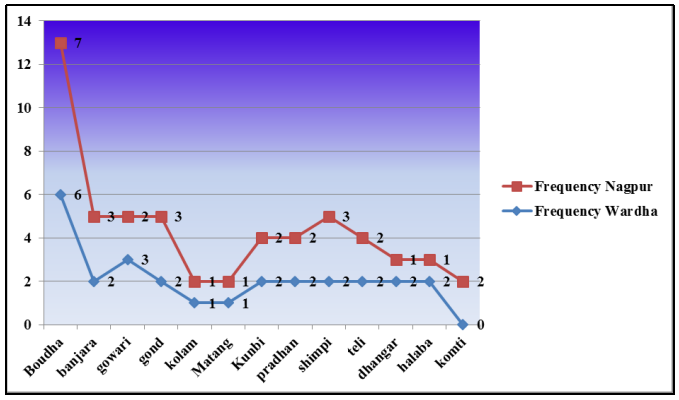

Fig 2: Caste wise distribution of individuals tested for prevalence of sickle cell anemia

No of sickler found in the study area

Table 2: Distribution of individuals positive for SCA in study area on the basis of their caste

No. of Sickler	Wardha	Nagpur
Boudha	3.70%	3.34%

Table 2: Indicates distribution of individuals positive for SCA in study area on the basis of their caste. On the basis of information provided in the table, majority of individuals belong to ‘boudha’ caste 3.70%, individuals from ‘Wardha and 3.34% individuals were from Nagpur (Figure 3).

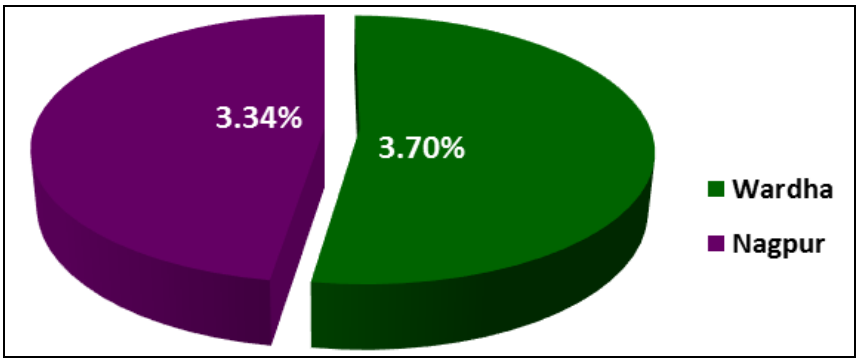

Fig 3: No. of Sickler

Table 3: Occupation of family of individuals tested for sickle cell anaemia

Occupation	Frequency Wardha	Percent	Frequency Nagpur	Percentage
Farmer	05	18.51	06	20
Daily wages	09	33.33	14	46.66
Carpenter	01	3.70	01	33.33
Cobbler	01	3.70	01	33.33
Blacksmith	02	7.40	01	33.33
Household work	07	25.9	05	16.66
Other	03	11.11	02	6.66
Total	27		30	

Table 3 Provides information regarding occupation of family of individuals tested for SCA in study area. Information in the table indicates that 33.33% & 46.66% of family tested are on daily wages, 18.51% & 20% were farmers, 25.9% & 16.66% individuals were household workers by occupation, 3.70% & 33.33% individuals were cobbler carpenter, However 11.11% & 6.66% were related to other occupation in Wardha and Nagpur District respectively.

Haemoglobin level of female

Haemoglobin level of individuals tested for prevalence of sickle cell anaemia in study area.

Table 4: Mean haemoglobin level of females of different age groups

Age Group	N	Non sickler	Sickler	RV	Mean Hb	Min	Max
20 to 25Yrs (Wardha)	27	26	1	12.1 TO 15.1 g/dl	9.3	6.6	12.1
20 to 25Yrs. (Nagpur)	30	29	1		9.2	6.2	12.2

N-Sample Size; RV- Reference Value; Mean Hb- Mean Haemoglobin; Min- Minimum; Max- Maximum

Table 4 provides information regarding the mean haemoglobin level of females of different age groups. Data shows that mean haemoglobin level in females of age groups 20 to 25 yrs was 9.3g/dl but it is 6.6 g/dl in sickler in Wardha In Nagpur mean Hb level is 9.9 g/dl and in sickler it is 6.2 g/dl. **(**Figure 4).

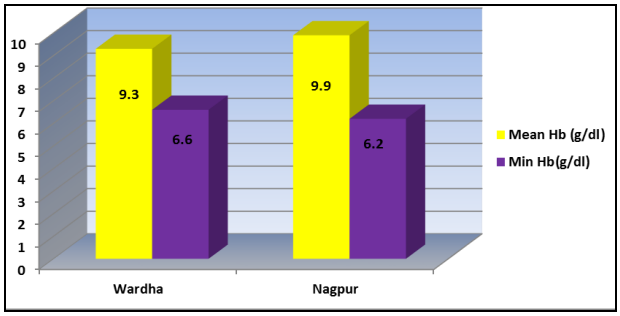

Fig 4**:** Haemoglobin level of female individuals tested for prevalence of sickle cell anaemia in study area.

It is apparent from the statistical analysis of data that females found positive for sickle cell anaemia recorded very low levels of haemoglobin (6.6 to 7.8 g/dl). However other females shown comparatively higher haemoglobin than the females of other same age groups, their mean haemoglobin level appears to be lesser than the standard recommended value. Thus, it may be concluded from the study result (Table 4) that female suffering SCA in the study area are haemoglobin deficient

Systolic blood pressure

Table 5: Systolic blood pressure of female individuals tested for prevalence of sickle cell anaemia

Age Group	N	Nonsickler female	Sickler female	RV	Mean Sys. BP	Min	Max
20 to 25 Yrs.	27	26	1	120 mm/Hg	130	110	150
20 to 25Yrs.	30	29	1		132	110	154

N-Sample Size; RV- Reference Value; Mean sys BP -Mean systolic blood pressure Min- Minimum; Max- Maximum

Table 5: shows data pertaining systolic blood pressure of female individuals of the study area. On the basis of information provided in the above table, mean systolic blood pressure of females of age group 20 to 25 yrs was 110 to 150 mm/Hg, and 110 to 154 mm/Hg in Wardha and Nagpur respectively. From the data (Figure 4)

It may be concluded that the females of all age groups suffering from sickle cell anaemia shows increased systolic blood pressure than non sickler females.

Table 6: diastolic blood pressure of female individuals

Age Group	N	Nonsickler female	Sickler female	RV	Mean Dias. BP	Min	Max
20 to 25 Yrs.	27	26	1	80 mm/Hg	87	80	94
20 to 25 Yrs.	30	29	1		85	80	90

N-Sample Size; RV- Reference Value; Mean Dias BP -Mean diastolic blood pressure Min- Minimum; Max- Maximum

Table 6 shows data pertaining diastolic blood pressure of female individuals of the study area. On the basis of

information provided in the above table, mean diastolic blood pressure of females of age group 20 to 25 yrs was ranging from 80 to 94 mm/Hg in Wardha and in Nagpur it was 80 to 90mm/Hg From the data it may be concluded that the females of all age groups suffering from sickle cell anaemia shows increased diastolic blood pressure than non sickler females.

PO_2 measurement

Po_2 measurement of individuals tested for prevalence of sickle cell anaemia in study area

Table 7: PO_2 measurement

Age Group	N	Nonsickler individuals	Sickler individuals	RV	Mean Po_2 level	Min	Max
20 to 25 Yrs.	27	26	1	95 to 100	98.1	94	99
20 to 25 Yrs.	30	29	1		98	92	99

N-Sample Size; RV- Reference Value; Mean po_2 -Mean O_2 saturation Min- Minimum; Max- Maximum

From the Table 7 It may be concluded that the individuals of all age groups suffering from sickle cell anaemia shows decreased po_2 level than non sickler individuals. if the level of po_2 is further decreased there may be need of blood transfusion

Heart rate

Heart rate of individuals tested for prevalence of sickle cell anaemia in study area

Table 8: Pertaining heart rate of individuals of the study area

Age Group	N	Nonsickler individuals	Sickler individuals	RV	Mean HR beats/min	Min	Max
20 to 25 Yrs.	27	26	1	70 to 130 beats/m	110.6	110	132
20 to 25 Yrs.	30	29	1		102.0	100	125

N-Sample Size; RV- Reference Value; Mean HR -Mean heart rate Min- Minimum; Max- Maximum

Table 8 shows data pertaining heart rate of individuals of the study area. On the basis of information provided in the above table, mean heart rate of age group 20 to 25 yrs was recorded as 110 to 132 beats/min, in patients from Wardha and in Nagpur it was recorded in the range of 100 to 125 beats/min From the data it may be concluded that the individuals of all age groups suffering from sickle cell anaemia shows increased heart rate than non sickler individuals

Symptoms Related to sickle cell anaemia commonly observed in patients are

The ability of the blood cells to carry oxygen is especially important in pregnancy. The sickling and anaemia may result in lower amounts of oxygen going to the foetus and slowed foetal growth. Because sickling affects so many organs and body systems, women with the disease are more likely to have complications in pregnancy. Complications and increased risks for the mother may include, but are not limited to, the following:

Infection, including urinary tract (especially kidney) and lungs, Gallbladder problems including gallstones, Heart enlargement and heart failure from anaemia along with stroke, acute chest syndrome, and painful crisis along with common symptoms observed in patient with sickle cell anaemia.

5. Summary of pregnant women studied in Wardha and Nagpur District

- Population under study comprises of 27 individuals from Wardha and 30 individuals from Nagpur district belonged to age group 20-25 years.
- Majority of individuals belong to 'boudha' caste 22.3% & 23.3%, individuals from Banjara, Gond, Kunbi, Pradhan, Shimpi caste were recorded 7.40 & 6.67% Furthermore 3.70% & 3.34% individuals of Kolam, Matang caste were recorded in Wardha and Nagpur district respectively
- Individual's positive for SCA in study area belongs to 'boudha' caste 3.70%, individuals from 'Wardha and 3.34% individuals were from Nagpur.
- Mean hemoglobin level in females of age groups 20 to 25 yrs was 9.3g/dl but it is 6.6 g/dl in sickler in Wardha in Nagpur mean Hb level is 9.9 g/dl and in sickler it is 6.2 g/dl.
- Systolic blood pressure of females of age group 20 to 25 yrs was 110 to 150 mm/Hg, and 110 to 154 mm/Hg in Wardha and Nagpur respectively. diastolic blood pressure of females of age group 20 to 25 yrs was ranging from 80 to 94 mm/Hg in Wardha and in Nagpur it was 80 to 90mm/Hg
- po_2 level was ranging from 94 to 99 mm/Hg, in Wardha and it was from 92 to 99 mm/Hg in patients of Nagpur
- Heart rate of age group2 0 to 25 yrs was recorded as 110 to 132 beats/min, in patients from Wardha and in Nagpur it was recorded in the range of 100 to 125 beats/min

6. Conclusion

Study about pregnant women reveals that female suffering Sickle cell anaemia in the study area are haemoglobin deficient, shows increased systolic and diastolic blood pressure than non sickler females. Decreased po_2 level in sickler pregnant women than non sickler individuals was observed. If the level of po_2 is further decreased there may be need of blood transfusion. Increased heart rate was observed in sickler females as compared to non sickler pregnant women.

7. Recommendations

- Significant proportion of PHC centers.
- Easy availability of medicines at cheaper rate.
- Pregnant mother to counsel for early registration & prenatal diagnosis.
- To check their 'sickling' status before marriage to avoid further spread of the disease.
- Demands screening of every pregnant mother as a policy.

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