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Anaemia Prevalence and Causes Among Tribal Communities

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Abstract: ***A serious health issue affecting tribal people is anaemia. Around 104 million peoples in India and 370 million peoples over the globe belongs to tribal communities which widely affected by anaemia. Women and children are the most affected population which is affected by anaemia. The primary objective of the present study is to provide the prevalence and causes of anaemia in the tribal communities with statistics and works of literature. The basic criteria for anaemia and symptoms of the same are explained. Moreover, the classification of the anaemia is provided along with the disparity explanation for the anaemia in children, women, and adults considering tribal communities. Furthermore, the possible causes of the decline in anaemia are explained through the statistics.***

Keywords: Anaemia; Haemoglobin; Iron; Sickle Cell; Tribal Communities; Thalassemia.

I. INTRODUCTION

Anaemia is a condition when there are fewer red blood cells or haemoglobin levels than normal. The symptoms include; it can cause one to feel exhausted, chilly, woozy, cranky, and out of breath. It is frequently brought on by a diet lacking iron, folic acid, or vitamin B12. Pregnancy, heavy periods, blood disorders, cancer, hereditary disorders, and viral infections are a few other factors that might cause anaemia. According to an IndiaSpend study of the past 2 Global Burden of Disease (GBD) surveys, iron-deficiency anaemia has continued to be the leading cause of disability in India for the past ten years. Widespread anaemia, which is caused by poverty, malnutrition, subpar sanitation, and an unbalanced vegetarian diet, has a negative impact on India's workforce's performance [1].

Particularly Indian tribes' diets are low in total protein and calories. Because they rely on their agricultural output, they frequently experience food supply volatility and undernutrition as a result. Additionally, the lack of adequate health and educational facilities and the presence of particular belief systems around nutrition and health make matters worse. High rates of preterm births, low birth weight, perinatal mortality, and maternal mortality are primarily caused by anaemia.

In tribes, the marginalised community has hidden morbidities that need to be identified to develop effective dietary solutions [2, 3]. As a result, the main goal of this study was to determine the prevalence of anaemia in the tribal population, especially women and children.

The World Health Organization (WHO) defines adolescence as the time between the ages of ten and nineteen years old. Anaemia has long-term impacts at this period of life since the young age is a critical developmental year, including developmental issues, cognitive functioning, lower immunity, irregular menstruation cycles, and later negative pregnancy effects. Additionally, a higher prevalence of anaemia has been connected to several illnesses, including rheumatoid arthritis, congestive heart failure, essential hypertension, hypothyroidism, and hypothyroidism. Most anaemia-related problems can be prevented if mild to severe anaemia is treated in its early stages, which commonly occur around adolescence [4].

II. ANAEMIA

When the body does not produce enough red blood cells, anaemia results. Iron and haemoglobin, a protein that aids in transporting oxygen through the blood circulation to your organs throughout the body, are carried by the cells as they move around the body. An individual is referred to as "anaemic" when they acquire anaemia. If the skin of the person appears overly pale or feels more exhausted or cold than usual, the person may be anaemic. This is a result of organs not getting the oxygen they require to function. Figure 1 demonstrates the basic criteria for anaemia [5].

1. **Hemoglobin:**
2. Male = Hb <13.5 g/dL.
3. Female = Hb 11.5 g/dL.
4. 2 years to puberty = 11.0 g/dL.
5. A Newborn = 14.0 g/dL is taken as a lower limit because of the high Hb.
6. **Hematocrit (Hct)**
7. Male = <42%.
8. Female = <37%.
9. In a broad sense, anemia is the blood's inability to supply adequate O2 to the tissue for proper metabolism.
10. These are the most common hematological disorders.
11. The diagnosis is essential for the physician to treat the cause of anemia.

Figure 1: Anaemia's basic criteria

Haemoglobin and erythrocytes are continuously created and destroyed. Since erythrocytes in humans have a lifespan of around four weeks, the complete reserve of circulating and reserved red cells must be replaced once every month. Simply put, anaemia is a loss of equilibrium between this natural process of replacement and destruction. Every anaemia requires the knowledge of 1. How much haemoglobin and cells have been destroyed. 2. What qualitative changes have occurred, such as variations in cell size and haemoglobin content. 3. The rate at which the cells are being eliminated. 4. The rate at which haemoglobin and cells are changing [6].

There has never been a clinical or laboratory classification of anaemia that has proven well. The majority of clinicians simply use a crude classification into primary and secondary kinds. The anaemias with no apparent cause and those with a colour index over 1.00 belong to the primary group, whereas those with known causes and those with a colour index under 1.00 belong to the secondary group. Such a classification is ineffective since it mixes clinical and haematological data [7]. In the subsequent section, a clinical and laboratory classification of anaemia has been provided.

A. Classification of Anaemia

A thorough blood study can easily yield this information. When 10 cc of blood containing an isotonic anticoagulant are centrifuged, a red cell count is performed, haemoglobin is calculated in grammes per hundred cubic centimetres, and the volume of packed cells per hundred cubic centimetres of blood is assessed. These statistics allow for the calculation of the mean cell volume, haemoglobin content, and haemoglobin per unit of cell volume in comparison to normal. If the biliary tract is not blocked, the amount of bile pigment in the blood is the best indicator of how quickly the blood is being destroyed aside from the red cell count. Since reticulocytes are young cells, the level of reticulocytes in circulation is the greatest indicator of the activity of red cell creation in the marrow. From a laboratory perspective, the average red cell's volume and haemoglobin concentration serve as the main criteria for classifying anaemia [8-12].

- *Normocytic and Normochromic:* The volume and colour indices are within acceptable bounds here (0.90 to 1.10). If anaemia is present, it is obvious that the quantity of cells must be decreased. Sickle cell anaemia is one of its kind.
- *Macrocytic and Hyperchromic:* The volume and colour indices are both more than 1.00 because the mean cell in this type is larger and contains more haemoglobin than usual. The number of cells always decreases as haemoglobin concentration per cell rises.
- *Macrocytic and Normochromic:* The volume index is larger than 1, the colour index is within normal bounds, and the cells are huge, but the average amount of haemoglobin per cell is normal.
- *Macrocytic and Hypochromic:* Although the colour index is below average in this instance, the volume index is still elevated.
- *Normocytic and Hypochromic:* The average cell volume and the volume index are within normal ranges, but a colour index of less than 1.00 indicates that the haemoglobin per cell has dropped.
- *Microcytic and Hypochromic:* The volume index is below what is considered to be typical (0.90). In this situation, the haemoglobin per cell is inevitably lower than average, resulting in a low colour index. Typically, there is little to no decrease in the quantity of red blood cells. Thalassemia is one of its kind.

The colours in the plasma are assessed by comparison with a diluted potassium bichromate solution and documented as the icterus index or quantified using the van den Bergh method to conclude the laboratory investigation. A Wright's stain-stained film is inspected for variability in dimensions and shape, hasophilia, nucleated erythrocytes, comparative number of platelets, and a differentiation count of the leucocytes. A vital stain is also made, and the reticulocytes are counted. Thus, the anaemic laboratory categorization is merely descriptive.

The best classification is always an etiologic one, which can be determined from a clinical perspective. Below is a successful clinical grouping based on the production method [13-16].

1) Increased Blood Loss

a) Mechanical as in acute haemorrhage

- Disturbance in blood coagulation
- Uterine bleeding
- Peptic ulcer

b) Accelerated destruction

- Haemolytic anaemia brought on by toxins and diseases
- Chronic haemolytic icterus

2) Decreased Blood Formation

a) Depression of marrow function

- Cachexia, long-term poisoning, metabolic issues, toxins, radioactive materials, malignancy, or tumour or leukaemia invasion of the marrow.
- Idiopathic aplastic anaemia

b) Lack of certain components required for the production of red blood cells normally

- Deficiency in specific anti-anaemic factors of the liver leading to pernicious and other macrocytic anaemias.

2. Iron deficiency from diet, disturbance in iron absorption or digestion, and maybe other unidentified chemicals required for haemoglobin synthesis, such as in chronic haemorrhage

B. Anaemia in Women

Anaemia can result from blood loss during menstrual cycles and delivery. This is especially true if you suffer from fibroids or heavy periods. During pregnancy, an iron shortage raises the risk of problems like premature birth. Studies have shown that babies born to women with low iron levels after birth are more likely to experience low birth weight and issues with their iron levels. Anaemia caused by a lack of iron is more likely to occur in pregnant women. She is the only source of iron and other nutrients for her unborn child. To avoid anaemia, many pregnant women take iron supplements. Eating well-balanced meals that include iron-rich foods and foods that provide B12 and B9 vitamins is suggested to ensure that the mother has enough iron for herself and the unborn child. Taking vitamins and adding iron to the diet according to the advice of the doctor [17].

C. Anaemia in Children

When babies transition from breast milk or formula to solid food, their iron intake may decrease. The body does not as readily absorb iron from solid food. When the body is growing, it need more iron. It's critical that kids have enough iron and other minerals in their meals to avoid anaemia and its associated issues with attention deficit disorder, delayed motor skill development, and learning difficulties. More attention should be paid to anaemia symptoms in older children during growth spurts and menstrual cycles [18].

D. Anaemia in Adults

Anaemia may contribute much more to disorientation or depression in elderly persons. Walking could be more challenging if the person is weak. If they have anaemia and are older and it is not treated, it could reduce their lifespan. Over 65s are more prone to have an iron-deficient diet and several chronic illnesses [19].

III. STATISTICS AND DISCUSSION

The WHO estimates that anaemia affects 24.8% of the world's population, affecting 27% of adolescent girls in developing countries and 6% of adolescent girls in developed countries. The National Family Health Survey (NFHS-4) found that 53% of Indian women between the ages of 15 and 49 are anaemic. Anaemia frequency varies greatly across India, with rural Rajasthan having a particularly high prevalence. Therefore, it is crucial to understand the causes of anaemia in rural areas. Girls in their adolescence who are aware of anaemia and its signs will be better equipped to look after their own health as they age. Additionally, by comprehending these aspects, a multimodal strategy for the management and prevention of anaemia in adolescent girls can be developed [20, 21]. Disability here refers to the absence of good health and has a broader definition. According to GBD recommendations, this comprises elements like mobility, self-care, involvement in daily activities, pain and discomfort, anxiety and despair, and cognitive impairment. According to the National Family Healthy Survey, 2004-05, iron-deficiency anaemia is common in India in children under three (78.9 percent) and women (55 percent); males follow at 24 percent (NFHS-3) (see figure 2). The primary signs and symptoms of this anaemia include weakness, lethargy, weariness, shortness of breath, and diminished mental acuity [22, 23].

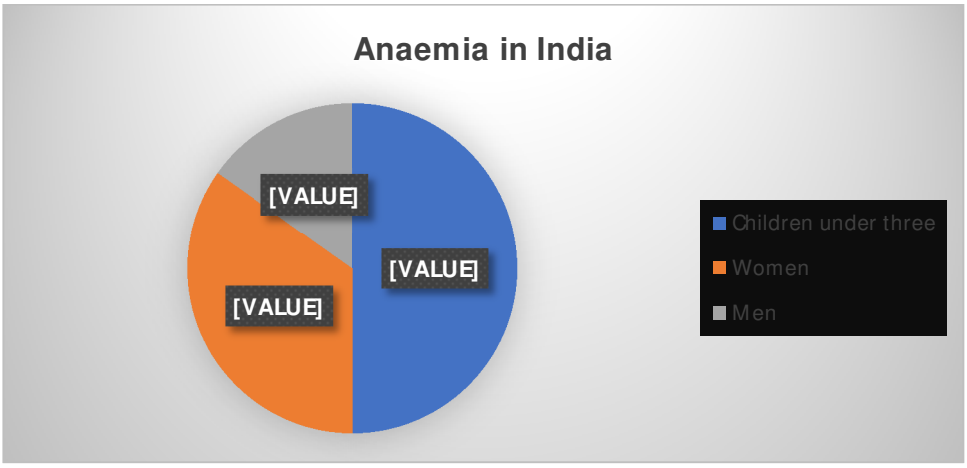

Figure 2: Anaemia in India

According to the most recent statistics, anaemia-related disability has decreased by 23% since 2005, although they remain the highest in the world. The cause of decline in children and women are demonstrated in Figures 3 and 4. 10.56 percent of all YLDs (Years lived with disabilities) in 2015 were caused by iron deficient anaemia. These numbers are double that of China and three times that of Russia among the BRICS countries. In terms of disability-adjusted life years (DALYs), India is at the top of this list as well. Figure 5 depicts the chart of YLD's percentage according to various countries [24, 25].

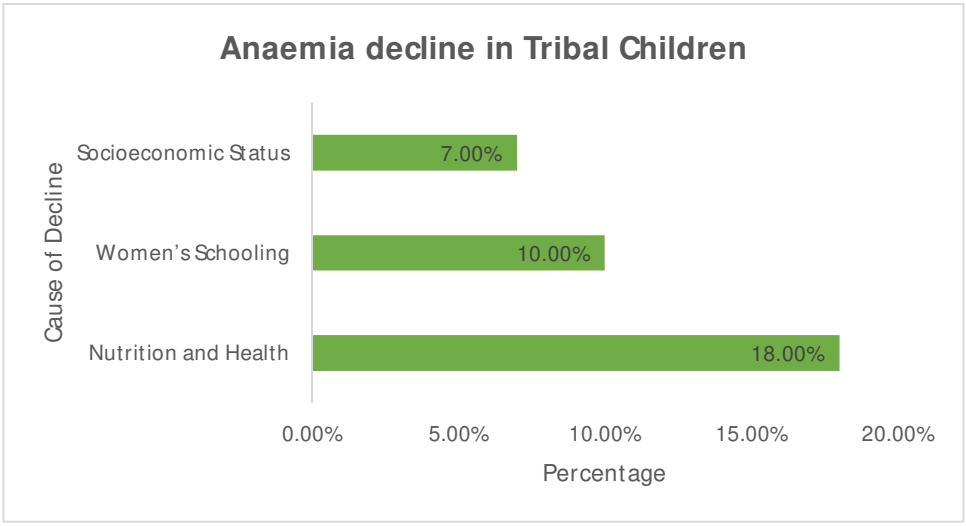

Figure 3: Cause of decline in Anaemia in Children

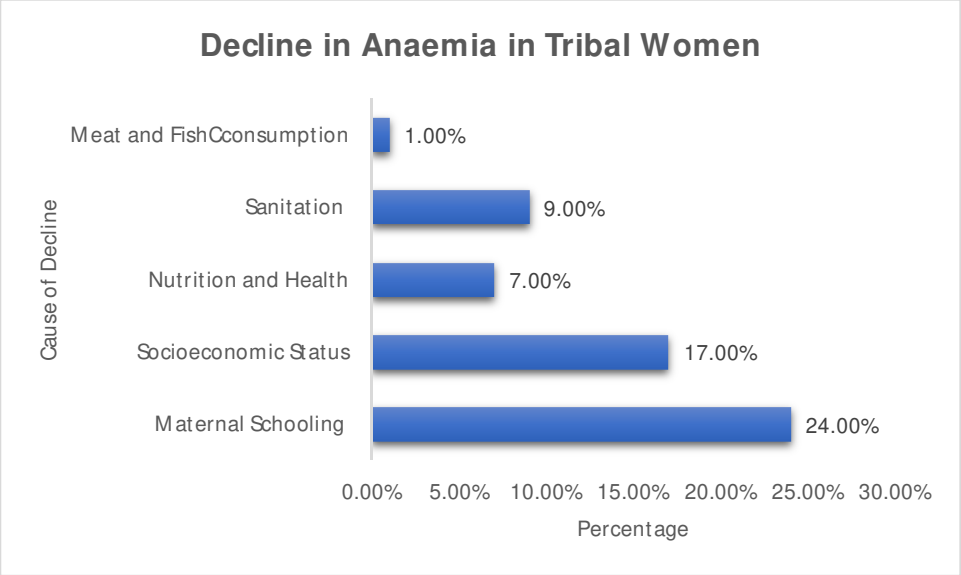

Figure 4: Cause of decline in Anaemia in Women

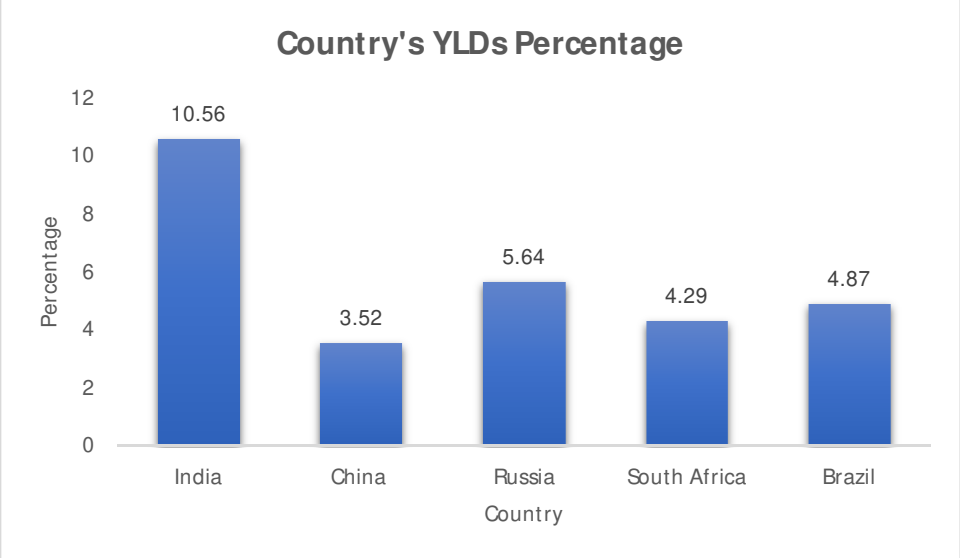

Figure 5: YLDs percentage according to countries

When compared to the general female population (32.7 percent), a sample of 347 tribal women's estimated haemoglobin levels indicate a significantly high prevalence of anaemia among the tribal women (51.9 percent) [26]. There could be a number of causes for this high incidence. The WHO recommends using 12 gm% of haemoglobin as the cut-off for diagnosing anaemia in non-pregnant women. The average haemoglobin level in this study sample was 9.6 gm%. It is necessary to research whether the WHO cut-off can be used for this ethnic group. However, the likelihood of iron deficiency anaemia's prevalence can only be very roughly estimated from the prevalence of anaemia alone. dietary iron insufficiency Because iron loss is somewhat reduced with iron shortage, anaemia is a mild form of the condition [27]. While mild anaemia was less common among study participants than among tribal people, as reported by NFHS 3, more than half of them had moderate anaemia, which was more common than among Keralan tribal people. The high prevalence of severe anaemia among tribal women, compared to 0.4 percent among other women, was the study's most startling finding, though. According to the study, the prevalence of anaemia among indigenous women increased as the number of pregnancies rose. Furthermore, women who had three or more children showed a 46 percent prevalence of severe anaemia [28].

High fertility has been identified by Murty et al. as a common cause of anaemia among India's tribal people. A woman's iron reserves are depleted via repeated pregnancies, which results in a lower haemoglobin level. In addition to increased fertility, maternal anaemia is linked to the time between subsequent pregnancies [29]. It is advised to wait at least two years between two consecutive pregnancies. 33 percent of anaemic women in our study had pregnancies that lasted fewer than 24 months. Short intervals between pregnancies cause iron reserves to be depleted, which results in anaemia [30].

A study done by Shazley MK among women of reproductive age group in Alexandria has shown that high parity and short birth intervals are risk factors for anaemia [31]. Similar findings were also obtained during research conducted among the Andhra Pradesh Chenchu tribal group. Among indigenous women who chewed pan, the prevalence of anaemia was 67.5 percent, compared to 32.5 percent among those who did not. In linear regression, it is discovered that haemoglobin levels rise in the absence of this habit (P = 0.006). Among tribal women, pan chewing is a frequently practised and socially acceptable habit [32]. Undernutrition and anaemia go hand in hand where anaemia manifests itself in the late stages of malnutrition. Our study revealed a higher prevalence of anaemia among women who are underweight (Tables 1 and 2). Linear regression for haemoglobin showed that an increase in BMI increased haemoglobin [33].

Table 1: Grades of anaemia among various age groups

BMI/grades of anaemia	Underweight (%)	Normal (%)	Overweight (%)	Total (%)
Severe	20 (10.8)	15 (9.7)	0	35 (10.1)
Moderate	119 (64)	71 (46.1)	4 (57.1)	194 (55.9)
Mild	42 (22.6)	62 (40.3)	2 (28.6)	106 (30.5)
Normal	5 (2.7)	6 (3.9)	1 (14.3)	12 (3.5)
Total	186 (100)	154 (100)	7 (100)	347 (100)

Table 2: grades of anaemia in various BMI categories

Food items	Never in a week (%)	At least once a week (%)	Daily (%)
Cereals	0	3 (1)	344 (99)
Green leafy vegetables	36 (10.3)	235 (67.7)	76 (22)
Fruits	125 (36.02)	204 (58.78)	18 (5.18)
Pulses	82 (23.63)	232 (66.85)	33 (9.51)
Milk	231 (66.57)	71 (20.46)	45 (12.97)
Egg	162 (46.68)	167 (48.41)	18 (5.18)
Fish	41 (11.81)	193 (55.61)	113 (32.56)
Poultry	205 (59.07)	141 (40.63)	1 (0.28)
Ghee	326 (93.94)	19 (5.47)	2 (0.56)

In an Indian investigation, the clinical severity of the illness varied in populations with coexisting α thalassemia, β thalassemia or other hemoglobinopathies in conjunction with iron-deficient anaemias. These individuals were spread occasionally over rough terrain and lived in remote rural areas [34].

The tribal populations of Arunachal Pradesh, Assam, and West Bengal have 3.7 and 4.2α deletional types of thalassemia. Hemoglobinopathies that cause anaemia are more common in Assam and Tripura, whereas cases of nutritional anaemia are more common in Arunachal Pradesh [35]. Low birth weight new-borns, who are at risk for death as well as for CHD, hypertension, diabetes, and obesity later in life, are tightly correlated with maternal undernutrition. Preterm birth, low birth weight, and miscarriages are all associated with low haemoglobin levels [36]. Therefore, nutritional intervention in women of reproductive age is crucial for the community's general growth. All of these tribes are unique and practise clan exogamy and community endogamy, which causes genes to localise in far-off regions. Some tribes have highly educated members who are easily motivated to think about concerns related to population health.

Our main goals were to offer to counsel, reduce anaemia, and stop the spread of hereditary disorders [37]. Severe HbE/thalassemia syndrome results from unions of HbE and β thalassemia carriers. In the future generation, there will be a steadily rising number of EE and E-β instances if premarital counselling is not offered. Offering pre-marital and pre-conceptional counselling is the only method to stop the increase in cases [38].

According to few studies [40-46], sickle cell anaemia is one of the most prevalent anaemia among the tribal. Sickle cell anaemia, often known as sickle cell disease, is a blood condition that runs in families. Haemoglobin, a blood protein, carries oxygen from the lungs to the tissues. While still able to carry oxygen, sickle haemoglobin is chemically altered in sickle cell disease and has a tendency to crystallise when oxygen is absent, changing the shape of red blood cells and giving them a sickle or half-moon-shaped appearance. It is referred to as a sickle cell trait or a sickle cell carrier if the sickle cell is inherited from only one parent. It is known as sickle cell disease or sickle cell anaemia if it is inherited from both parents (homozygous sickle cell). Other than from one's parents, there is no other method to acquire sickle haemoglobin [47].

Lehman and Cutbush initially identified sickle haemoglobin in the indigenous tribes of the Nilgiri hills in southern India in 1952 [48]. Since then, numerous demographic groups have been examined, and it has been discovered that three socioeconomically disadvantaged ethnic groups—the scheduled tribes, scheduled castes, and other backward classes in India—are more likely to carry the sickle cell gene [45]. Among various tribal groupings, the percentage of sickle cell carriers ranges from 1% to 40%. 10. With an approximate 9, 61,492 sickle heterozygotes, and 67,861 sickle homozygotes, Madhya Pradesh has the largest load [49].

All of Maharashtra's eastern districts, often known as the Vidarbha region, the Satpura ranges in the north, and some areas of Marathawada are affected by the sickle gene. Between 0% and 35% of members of certain tribes are sickle cell carriers. The Bhils, Madias, Pawaras, Pardhans, and Otkars are among the tribal tribes having a high frequency of HbS (20-35 percent) [42]. The whole 1,25,000-person tribal community in Kerala's Wayanad district was screened, and after that, genetic counselling was provided, during which carriers of HbS were urged not to marry non-carriers. The frequency of HbS among certain tribes is extremely high (18.2 to 34.1 percent) [43].

The Dhodia, Dubla, Gamit, and Naika tribes in Gujarat have a high rate of HbS. (13-31 percent). More recently, the Gujarat State Branch of the Indian Red Cross Society conducted very thorough demographic surveys, screening 1,68,498 tribal people from 22 districts. The prevalence of sickle cell carriers was found to be 11.37 percent overall. Chaudry, Gamit, Rohit, Vasava, and Kukana are some of the tribal communities in south Gujarat that exhibit both a high prevalence of HbS (6.3 to 22.7 percent) and the -thalassaemia trait (6.3 to 13.6 percent). These tribal tribes would probably inherit both of these genes together [48, 49].

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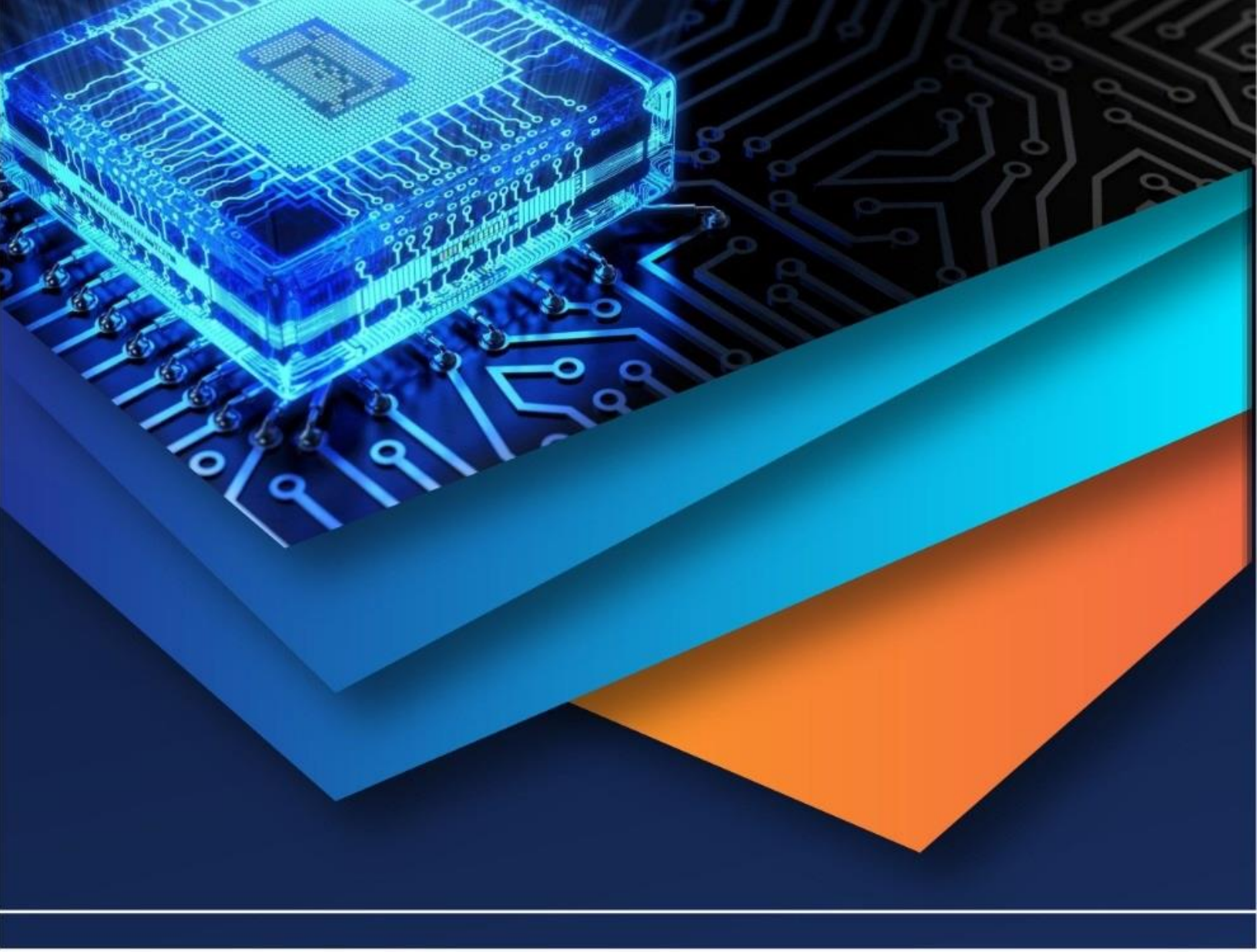

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