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ENHANCING OCCUPATIONAL HEALTH AND SAFETY MEASURES FOR TANNERY INDUSTRY WORKERS.

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ABSTRACT:

The study on Occupational Health and Safety in the tannery industry focuses on promoting the health and safety of workers in India. Industrial workers in such hazardous environments are often exposed to various occupational risks. There is a continuous, two-way interaction between the individual and their psychological environment, where the work environment can influence a worker's health, either positively or negatively. A worker's physical and mental well-being directly impacts their productivity. When the work environment is well-adjusted and conducive to productivity, it can play a significant role in promoting overall health. Industrial and sewage pollutants in the tannery industry can adversely affect workers' hematological and biochemical parameters. Despite the risks and hazards involved, many workplace accidents are not subjected to legal formalities, and the lack of awareness about health and safety among workers is a significant issue. This lack of awareness is often due to low levels of education among the workers and the insufficient attention paid to health and safety by management in the tannery industry. This study aims to highlight the critical need for better health and safety measures in the industry to protect workers and improve their overall well-being.
Keywords: Occupational health safety, Hazards, risk, legal formalities, industrial and sewage pollutants.

INTRODUCTION:

The present study reveals that the following findings which will be very much useful for the abatement methods for the occupational health of the tannery workers. The nature of the toxic chemicals handled within the tannery industries itself is not good for the health of the workers. Bare handling of chemicals like sulphides, acids, bases, chromium compounds and others organic compounds, dust of hides, hair and chemicals inhaled by the workers leading to bronchitis and lung diseases. Workers are exposed to various

types of skin disease and anthrax during various processes involved in the tanning. It causes lung diseases, nausea, respiratory tract diseases, skin allergies and dermatitis. Tannery chemicals attack mucous membrane of nose, throat, liver and kidney. They also cause asthma bladder cancer and tumors. As per the ESI report concentrated gases from pits are poisonous and cause respiratory tract problems and damage to lung diseases.

Acute Pharyngitis is caused by obnoxious gaseous air pollutants like Hydrogen sulphide. Respiratory diseases are caused by hydrogen sulphide, Sulphur dioxide, phenol and other inhaled gaseous air pollutants. Asthma is also caused by isocyanates and formaldehyde used in finding precludes. T.B is caused by inhalation of toxic vapours and dust.

Acid burns are caused to the tannery workers due to improper handling of concentrated acid. A significant increase of total count in blood (T.C) and (D.C) differential leukocyte counting in blood indicating various diseases like dermatitis, T.B, lung diseases. A significant decrease in Hemoglobin content in blood leads to anaemia. A significant increase in ErythroSedimentationRate (ESR) indicates Tuberculosis (TB) among tannery workers. Increase of Eosinophiles indicates skin allergy.

Based on the analysis of blood samples were collected from the occupationally exposed to the tannery environment it is observed that the tannery workers face a lot of serious health problems due to continuous exposure of toxic chemicals. The common health hazards finding here are, respiratory disorders, vomiting, skin rashes and diarrhea. Toxic chemicals used in tanneries contaminate the surface water. The use of such contaminated water for drinking purpose causes various types of illness. The contaminated water in the polluted area will cause the disease like Diarrhea, Respiratory diseases and Skin diseases.

Exposure to toxic gases also causes many disease conditions. The results obtained during the investigations of blood samples and samples collected from the tannery workers who were constantly exposed to the variety of chemicals that are volatile in nature and highly toxic. If they are inhaled or handled without proper gloves, the workers may suffer from various types of diseases like allergy, asthma and bronchial disorders.

OBJECTIVES:

- To evaluate the physico-chemical composition of tannery effluent and assess its impact on the occupational health hazards faced by tannery workers and nearby communities.
- To examine the health status of tannery workers who are constantly exposed to various chemicals, including conducting health screenings.
- To analyze the adverse effects of tannery-related exposure on workers' hematological and biochemical parameters through blood sample analysis and pathological diagnoses.
- To create awareness among tannery workers about occupational health risks and recommend effective abatement measures to enhance their health and safety.

TANNERY ENVIRONMENT AND OCCUPATIONAL HEALTH:

Health is a multi-dimensional term (WHO). Health denotes, “A state of physical and social well-being and not merely the absence of diseases or infirmity”. When an individual’s health fails it is not only due to genetic or biological reasons, but his environment i.e., living and working conditions accounts for it. Man is shown to be the vital factor of his own environment. The status of man’s health represents the result of complex interactions between his internal biological system and the total internal working environmental system.

Tannery waste water pollution causes a serious health hazard to man. The occupational health hazards caused in the long run are even more jeopardizing. The tannery effluent apart from being an eyesore and source of noxious odour is the breeding place for insects causing diseases like malaria, dengue and filaria. The health hazards among tannery workers are intestinal, respiratory and neurological disorders. The unfenced pits used for releasing tannery waste causes constant risk for workers, for they may fall into the pit. The pits are also the source of hydrogen sulfide, carbon dioxide gases produced by the chemicals used for processing. Concentration of gases is poisonous and a great threat to the health of the workers. Spillage of chemicals on the workers body occurs during the transfer of materials between different operations. Improper drainage of chemicals from the pits floods the floor with corrosive chemicals. Slipperiness due to wet and greasy floor is a potential danger to the general movement of workers.

Toxic chemicals causes’ chronic ailments. The heavy metal exposure causes a variety of complications and serious health hazards, like contract dermatitis. The well water near the tannery industry and the sewage nearby causes gastroenteritis, amoebiasis, geardiasis, T.B and other dysentery associated diseases. Lower

respiratory diseases are more common among the industrial workers. Long term exposure to heavy metals leads to liver cancer, eyelid ulceration, conductivities and asthma among the workers.

A detailed study on the impact of tannery environment on occupational health status of the tannery workers working in Dindigul is necessary for the health department to draft future plan to prevent the occupational health risks and also to improve the health status of the tannery workers.The study of health status of the tannery workers was carried out by clinical laboratory findings involving the hematological and bio-chemical analysis of blood specimen from the tannery workers.

CLINICAL LABORATORY FINDINGS OF TANNERY WORKERS:

The occupational environment can have an adverse effect on hematological, bio-chemical parameters of the tannery workers. This makes an investigator to focus the attention on the immunologic effect of the environmental pollutants. Therefore, in the present study, an attempt has been made to evaluate the effect of occupational environment by pathological diagnosis using the blood sample of the tannery workers working in the tannery for long time.

We gathered data from around 10 permanent workers employed in the tannery industry, all of whom have received treatment at the ESI hospital in Begambur, Dindigul. Among them, some workers with over 20 years of experience were specifically chosen for blood analysis.

The following **inclusion criteria** were used for blood analysis:

- Workers directly involved in tanning operations.
- Workers who have been employed in the tannery units for more than ten years.
- Male workers aged between 45-60 years.

The **exclusion criteria** were based on the following:

- Recently employed workers were not included.
- Workers with chronic diseases such as tuberculosis, anemia, or asthma were excluded from the study.

These tannery workers were compared with a control group consisting of:

- Age-matched and sex-matched healthy individuals from similar socio-economic backgrounds, residing in different parts of the town, who served as normal controls.

PARAMETERS ANALYSED

(a) Total Leukocyte count (TLC)
(b) Differential Leukocyte count (DLC)
(c) Erythrocyte sedimentation rate (ESR)
(d) Hemoglobin levels (Hb)

BIO-CHEMICAL PARAMETERS

(a) Total serum protein
(b) Albumin, Globulin and
(c) Albumin /globulin ratio.

METHODOLOGY

The techniques of hematology are concerned mainly with the cellular formed elements of blood, their number or concentration, the relative distribution of various type of cells and structural or bio-chemical abnormalities that promote diseases.

PROCEDURE FOR COLLECTION AND STORAGE OF BLOOD SAMPLES

For Hematological parameters, venous blood (6 ml) was drawn from the anticubital vein by means of sterile disposable syringe after surface sterilization of the area with ethanol. In order to avoid the contamination, separate disposable syringes and needles were used for each collection of blood.

For determination of total and differential leukocyte count and hemoglobin content, 2 ml of blood was collected in sterile tube containing EDTA (Ethylene Diamine Tetra Acetic Acid), a powerful anti-coagulant. To carry out ESR (Erythrocyte sedimentation rate) 2 ml of blood was collected in a sterile test-tube containing 0.5 ml of 3.8 per cent trisodium citrate as anticoagulant. Similarly, 2 ml of blood was delivered into another tube without any coagulant and kept for serum separation (Ramnik Sood ,1998).Blood samples collected for serum separation were immediately transported to the laboratory within an hour or two. The blood after clotting was stored in refrigerator overnight at 4°C.Serum was then separated using centrifuge on the following day and stored in storage vials at 20°C for further analysis as per the method described by (Nanda kumar et al ., 1990).

PROCEDURES FOLLOWED FOR HEMATOLOGICAL PARAMETERS:

1. PROCEDURE FOR THE TOTAL LEUCOCYTE COUNT (TLC)

The freshly drawn blood samples with EDTA from both experimental and control subjects were brought to the laboratory within an hour after bleeding. Using a WBC pipette and hemocytometer, the total leucocytes count (TLC) was made as outlined by (Ramnik Sood,1998)

2. PROCEDURE FOR THE DIFFERENTIAL LEUCOCYTE COUNT (DLC)

The differential leukocyte count was done by following a standard procedure followed in most of the clinical laboratories. In brief, a thin blood film was made by speeding a drop of blood across a clean slide using smooth edged slides and stained with using Leishman's stain. For every blood sample, two or three slides were made and the good ones were used.

For the differential leukocyte count the area where the morphology of the cell is clearly visible is chosen. Based on the standard morphology criterion, the different leukocyte populations namely Neutrophil, Basophil, Lymphocytes and Monocytes were counted by moving the slide in the order. A minimum of 200 nucleated cells were counted and the results expressed as per cent population in each category.

3. HEMOGLOBIN ESTIMATION:

Estimation of blood Hemoglobin (Hb) of both experimental and control subjects was done using photo-electric colorimeter.

4. ERYTHROCYTE SEDIMENTATION RATE (ESR):

ESR is the rate at which erythrocyte sediment on their own weight when anti- coagulated blood is held in a vertical column. It is expressed as the fall of RBCs in man at the end of the first hour. ESR was measured by Westergren's method.

PROCEDURE FOR BIO-CHEMICAL ESTIMATION:

Estimation of the total protein and albumins by modified Biuret and Dumas method

Total proteins and albumins in the serum sample were estimated by modified Biuret and Dumas method, using a diagnostic reagent kit supplied by M/s. Span Diagnostics. Serum globulin and A/G ratio were calculated from the values of total protein and albumin.

RESULTS AND DISCUSSIONS:

In order to assess the health hazards associated with chemicals used in the leather industry blood samples were collected from the persons in tannery industry in order to diagnosis diseases like lungs disorder, gastro intestinal tract infection. Hexavalent chromium causes dermatitis, allergic skin reaction and skin veneration. The acceptable standard lever of Blood Parameters for human beings as given below

S. No	Blood Parameters	Standard level
1.	Age Groups	45-60
2.	Total leucocytes count (TC) No. of cells/mm^3	4000-10000
3.	Differential count (DC)% P	40-60%
	L	20-40%
	E	Up to 6%
	M	2-10%
	B	Up to 2%
4.	Erythrocyte sedimentation rate (mm/hr)	5-20 (mm/hr)
5.	Hemoglobin (gms %)	14-16 gms %
6.	A/G ratio	1.2:1-2.5:1

TC: Total Count L: Lymphocytes B: Basophile
DC: Differential Count E: Eosinophiles P: Polymorphous M: Monocyte

The results obtained for the blood samples of the tannery workers, given above the compared with the following table and discussed.

S. No	Parameter	Normal Values	Increases Due to	Decreases Due to
1.	Total leukocyte count (TC) No of cells/mm^3	4000-10000	Any toxic substance Hemorrhage due to toxicsubstances, rheumatic fever	Leukemia, aplastic anaemia
2.	Differential count (%) Polymorphs	40-60%	-	-
(i)	Lymphocytes	20-40%	Lymphatic leukemia, Thyrotoxicosis	Shyphilis, Any intoxication
(ii)	Eosinophil	Up to 6%	Any radiation. All allergic condition parasitic infection	-
(iii)	Monocyte	2-10%	Monocytic leukemia Due to intake of increased lipids all protozoan infection.	-
(iv)	Bosophile	Up to 2%	Polycythemia (increased WBC) chicken pox, small pox, all intoxication.	Decreases due to pregnancy. Hyper thyroidism.
3.	ESR (mm/hr)	5-10	Any occult blood, rheumatic fever, rheumatic Arthritis, Tuberculosis.	Sickle cell Anaemia. Hepatic diseases.
4.	Hemoglobin Hb	14-16gms%	Over intake of protein. Dehydration, Multiple My	Over hydration malnutrition, Pregnancy, liver diseases.
5.	Biochemical observation:			
(i)	Total protein	6-8 gms/dl	Over intake of protein, Dehydration, Multiple Myeloma.	Over hydration, Malnutrition, pregnancy, Liver diseases.
(ii)	Albumin	3.2-5 gms/dl	Dehydration	Liver disease. kidney disease, inflammation pregnancy, Malignancy
(iii)	Globulin	2.3-3.6 gms/dl	Emphysema	Nephrotic syndrome and Malnutrition.

HAEMATOLOGICAL PARAMETERS:

1. TOTAL LEUCOCYTE COUNT (TC):

The presented results compare the total leukocyte count between the experimental samples with standard levels. The increased total leukocyte count was due to frequent infection like bacterial viral,

protozoan and parasitic infections caused by the exposure of chemical hazards and by the use of contaminated water for drinking purpose. According to Gautam Mahajan (1987) disease causing bacteria are present in effluent and sewage contaminated water. Chronic infections state and illness like dysentery results in leucocytosis in the affected individual.

2. DIFFERENTIAL LEUCOCYTE COUNT (DC):

The analysis of individuals shows that the abnormal rise in Eosinophil percentage in table. Some samples show abnormally high values. High Eosinophil count is due to allergic skin reactions, chronic respiratory infection and worm infestation.

3. HAEMOGLOBIN (HB):

The condition namely anaemia shows the low levels of Haemoglobin. Decrease of Haemoglobin levels indicates the prevalence of tuberculosis. Skin diseases Hudson (1985)

Anaemia caused by worm infestation (Hood worm) amoebic dysentery also shown low Hb level.

4. ERYTHROCYTE SEDIMENTATION RATE (ESR):

The samples of low Hemoglobin level show the value of Erythrocyte sedimentation rate. In case of samples with tuberculosis, there will be the decreased levels of Hb and increased number of ESR.

BIOCHEMICAL PARAMETERS:

1. TOTAL PROTEIN AND A/G RATIO:

Estimation of Serum protein, globulin and A/G ratio were carried out and the results are shown in table.There was a decrease in A/G ration when compared to the standard level.Decrease in total protein is due to low albumin level. Decrease in level protein is associated with malnutrition severe and chronic infection and diseased state.

Comparison Table for Standard values of Blood parameters Vs Blood samples from the Tannery Industry Workers.

Blood Parameters		**Standard Value**	**Blood samples from the Tannery Industry Workers**				
			S1	S2	S3	S4	S5
Age Groups		45-60	48	51	58	54	46
TC (No of cells/mm^3)		9500	8,500	9,800	10,300	8,500	9,800
DC (%)	P	40-60%	65	70	70	64	68
	L	20-40%	30	28	28	30	40
	E	Up to 6%	5	2	2	6	2
	M	2-10 %	1	1	1	2	1
	B	Up to 2%	1	2	1	1	2
ESR(mm/hr)		5-20	15/30	20/40	30/60	20/40	15/30
Hemoglobin		14-16gms%	10.5	10.8	10.2	11.8	11
Protein			7.0	6.8	6.8	6.9	6.9
Albumin			4.5	4.0	3.5	3.4	4.5
Globulin			2.5	2.8	3.3	3.5	2.4
A/G Ratio			1.8	1.4	1.0	0.9	1.8

TC: Total Count L: Lymphocytes B: Basophile
DC: Differential Count E: Eosinophiles P: Polymorphous M: Monocyte

PATHOLOGICAL INVESTIGATION

1. **Polymorphs:**

The polymorphs count of the five samples are varied from 64 to 70 but the normal value is 40-60%. Here there is an increase of polymorphous from 64-70% indicating infection of the lungs to workers.

2. **Lymphocytes**

The Lymphocytes counts of selected samples are varied from 28 to 40% and the normal values range from 28 to 40% and the normal values range from 20 to 40% indicating infective disease

3. **Eosinophiles**

The Eosinophiles counts of the selected samples varied from 2 to 6% but the normal values up to 6%.The result of the various blood samples of the tannery workers with age group of 40-46 are presented and discussed.

4. **TC(Total Leukocyte Count)**

The TC values for selected five samples varied from 8500 to 9800 cells/mm^3. Whereas the normal values range from 4000 to 10000.

5. **Differential Count (DC)**

Differential count includes the percentage of polymorphs, lymphocytes, Eosinophiles, Monocytes and basophiles.

6. **Hemoglobin (Hb)**

The Hb values of the given samples are varied from 7 to 10 gms. But the normal values range from 14 to 16 gms. The deviation is due to Anaemia of the Tannery workers.

BIOCHEMICAL INVESTIGATION

1. **TOTAL PROTEIN:**

The normal values of control samples is 6 to 8 gms/dl but the observed values for five samples are in the range of 6.8 to 7 gms indicating the normal values of the worker, These results are not within the standard limit. The deviation is due to allergic and asthma condition of the workers.

2. **MONOCYTES:**

The Monocytes of the selected samples are varied from 1 to 2 % and the normal values are 2 to 10% and there is a decrease in monocytes due to T.B infection.

3. **ERYTHRO SEDIMENTATION RATE (ESR):**

The ESR values of five samples are varied from 15mm/hr to 60mm/hr but the normal values in 5 to 20. The deviation indicates the presence of T.B among Tannery workers.

4. **ALBUMIN:**

The normal albumin values range from 3.2 to 5 gms/dl but the observed values for five samples range from 3.4 gms/dl to 4.5. The values are within the normal limit.

5. **GLOBULIN:**

The normal globulin values range from 2.3 to 3.6 gms/dl but the experimental values for the five samples from 2.4 to 3.5 indicating the values are within the normal limit.

6. **A/G RATIO:**

The normal value of A/G ratio is 1 to 1.38 gms/dl. But the observed values are 0.9 to 1.8 indicating there is a deviation from the normal values indicating malnutrition of the tannery workers.

MICROBIOLOGICAL PARAMETER:

SPUTUM TEST:

The samples having high ESR values give the positive result for sputum test for Acid fast Bacillus.There will be red coloured bacilli, occurs in the microscopic examination.The samples of tanners were collected and the test was done in separate laboratory.

PATHOLOGICAL PARAMETER:

1. **MOTION TEST:**

The sample of tannery workers shows different kinds of worms in it. The Hb level was decrease if any worm present (Hook worm). TheEosinophiles count will get increased above normal. Extremely high Eosinophil level can occur in this case. In case of Dermatitis, there will be the presence of worms in sample. There will be the decreased levels of Hb. Hence total protein also gets reduced. From the result of the present

investigation, it is evident that the tannery workers are affected mainly by eosinophilia, tuberculosis, Dermatitis and anaemia.

2. EOSINOPHILIA:

In eosinophilia cases the Eosinophiles levels are increased. In the differential count the Eosinophiles level will be red above 6%. From the result the TC values are normal. Polymorphs, lymphocytes, Monocytes, Basophil are also coming under normal level where as the Eosinophil levels are increased above 6%. So, the sample collected from tannery workers shows the symptoms of eosinophilia. It has been reported that emphasis is now given for environmental research and health hazards in order to overcome the physical exposure to fumes, dusts and toxic substances.

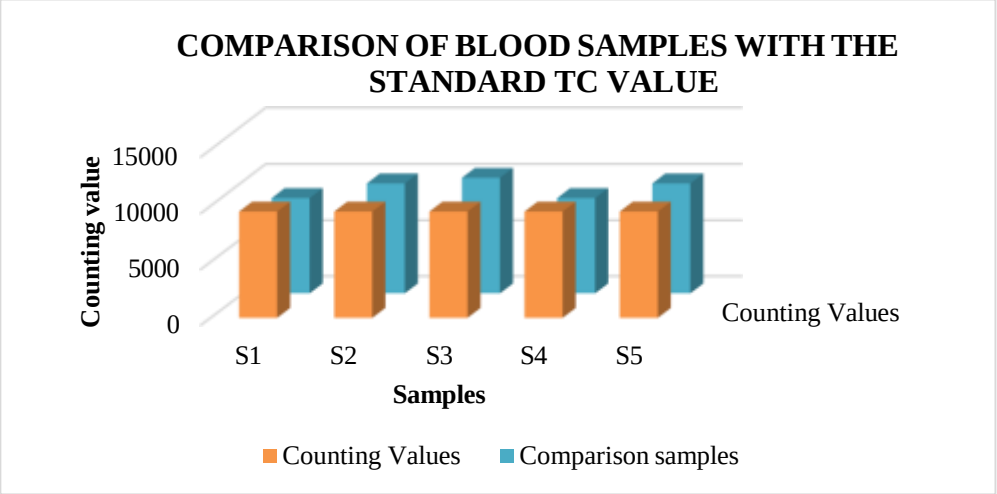
3. TUBERCULOSIS:

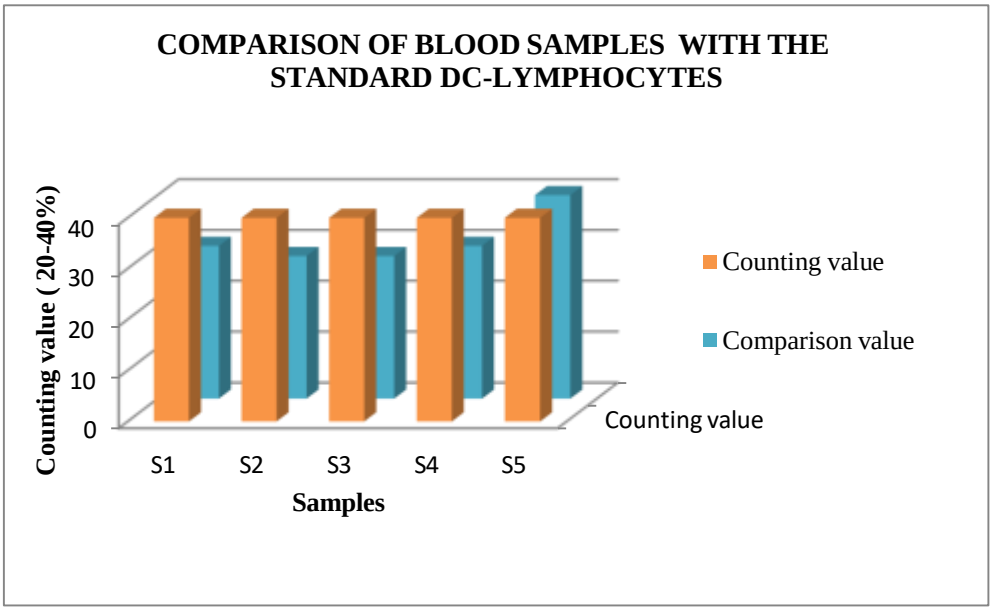
In tuberculosis the erythrocyte sedimentation rate is increased. Eosinophil counts also increase above 6%. The sample from selected individual shown the positive result for Tuberculosis. When the sample is subjected to the spectrum test for test for Acid Fast bacilli (zeihl Neelsen) there will be the appearance of Red coloured Bacilli. This shows that the presence of the disease condition tuberculosis. In this condition the Hemoglobin level will get reduced. The table shows that data. This is categorized into Bacilli in each view of the objective lens having the power 100x.If the person having tuberculosis with the erythrocyte sedimentation rate 25 is untreated, he will get increased the value +5 in the beginning stage. Then the value will get increased to +7 and then with +9. (25+5+7+9). Finally, the affected person will get the ESR value of 5%. He will come under the +4 category. Decreaseof Hemoglobin indicated the prevalence of tuberculosis, skin diseases and frequent occurrence of typhoid and malarial fever.Air pollutants like toxic vapours and dust causes pulmonary tuberculosis. Some of the air pollutants affect the lungs directly while others are absorbed in the blood stream through the lungs and caused along tuberculosis Gautam Mahajan (1987) reported that the disease causing bacteria in sewage mixed effluent includes bacteria of Vibrio (Cholera) Salmonella group (Typhoid) Shigella (Bacillary dysentery) and mycobacterium (Tuberculosis) pathogenic virus include entero virus, can cause a wide variety of diseases including gastro enteritis, liver disease diarrhea, respiratory illness, Paralysis, Heart diseases and various infections.

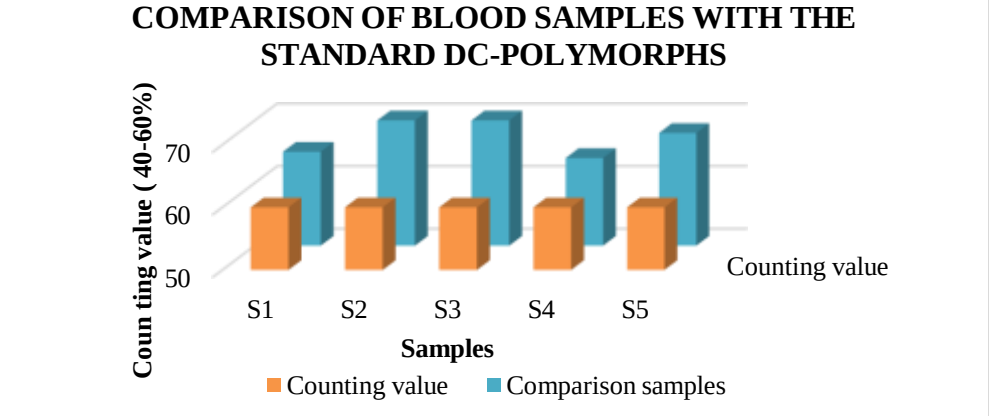
4. DERMATITIS:

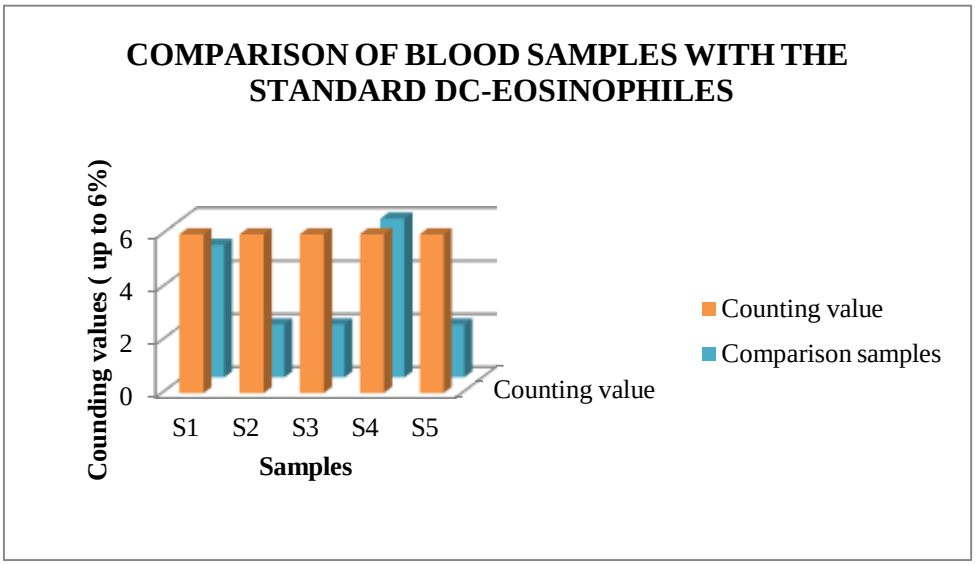
In the Dermatitis there will be an increased level of Eosinophiles. The Eosinophil level will get increased to above 7. Erythrocyte sedimentation rate value will be within a limit (Normal level). The other differential count values such as polymorphs, lymphocyte, Monocytes & Basophiles except Eosinophil come within normal level.The motion test show the presence of norms. The faces sample of the selected individuals shows the presence of worms such as Guinea worm, Strongyloides stercoralis, Round worm ova (Ascaris) Hook worm. Thread worm and tape worm ova etc., The Eosinophil level will get increased in parasitic infections & in allergic conditions. Due to the parasitic infections the previous might be anemic also. So the total protein also gets decreased. Delvin (1981) observed that the decrease in total protein is associated with malnutrition, severe chronic infection and diseases. Decrease of Hemoglobin indicates the prevalence of tuberculosis, skin diseases and frequence occurrence of typhoid. Mukerjee (1981) revealed that the reason for increased total leukocyte count is due to frequent infection like bacterial, viral, protocol and parasitic infection caused due to use of contaminated water for drinking purpose. Chronic infections stone and illness would result in increase of total leukocyte count in the affected individuals.

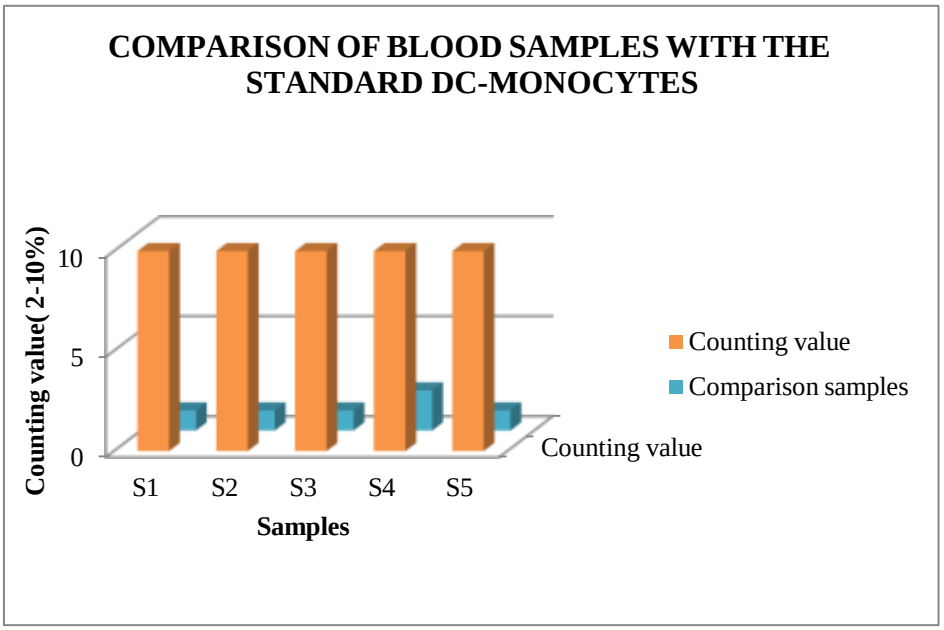
Dozha and Dusa (1982) studied the water borne diseases in Bikaner district. Medical records reveals that generally water borne diseases affect stomach, kidneys. Other infections are caused by directly drinking untreated water of river. People are found to be suffering from norms disease. The Chromium compound used for leather tanning may sensitizer both workers in tanneries and users of leather products which causes the contact dermatitis of the feet. This study revealed that the incidence of skin disease among workers in the tan-yard was very high as compared to those not working in the tan-yard.

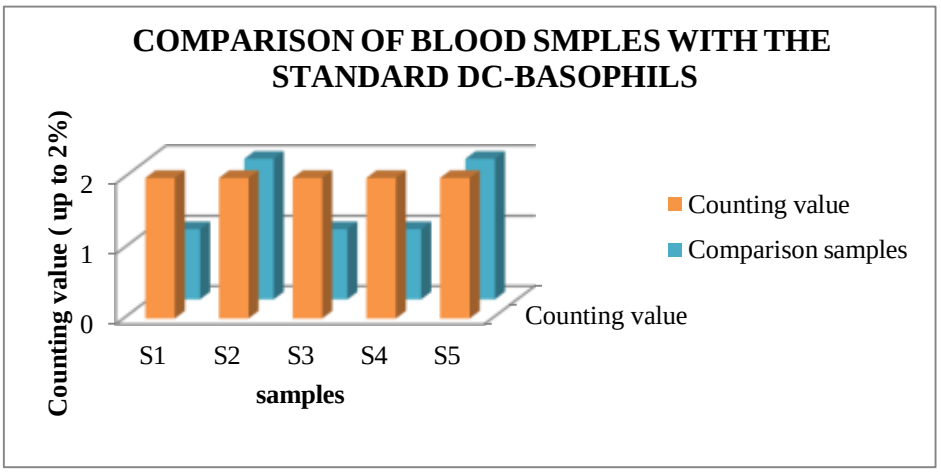

COMPARISON OF BLOOD SAMPLES WITH THE STANDARD TC VALUE
Counting value
15000
10000
5000
0
S1
S2
S3
S4
S5
Samples
Counting Values
Counting Values
Comparison samples

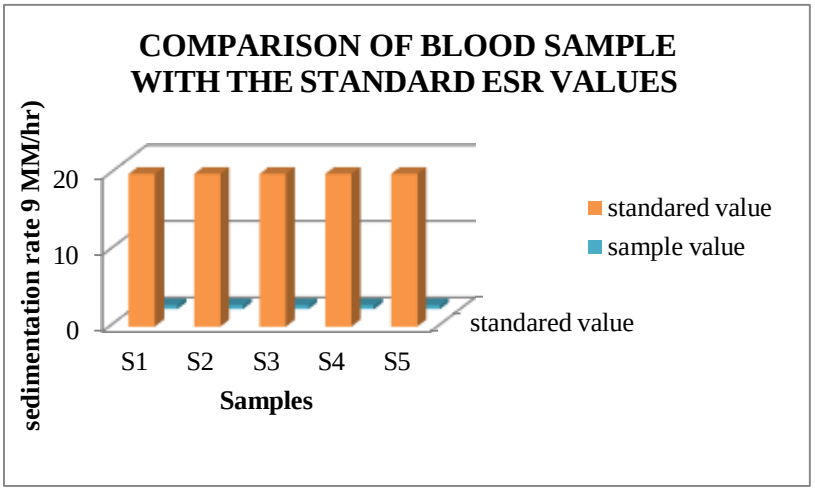

COMPARISON OF BLOOD SAMPLES WITH THE STANDARD DC-LYMPHOCYTES
Counting value (20-40%)
40
30
20
10
0
S1
S2
S3
S4
S5
Samples
Counting value
Comparison value
Counting value


COMPARISON OF BLOOD SAMPLES WITH THE STANDARD DC-POLYMORPHS
Coun ting value (40-60%)
70
60
50
S1
S2
S3
S4
S5
Samples
Counting value
Counting value
Comparison samples


COMPARISON OF BLOOD SAMPLES WITH THE STANDARD DC-EOSINOPHILES
Counding values (up to 6%)
6
4
2
0
S1
S2
S3
S4
S5
Samples
Counting value
Counting value
Comparison samples


COMPARISON OF BLOOD SAMPLES WITH THE STANDARD DC-MONOCYTES
Counting value(2-10%)
10
5
0
S1
S2
S3
S4
S5
Samples
Counting value
Counting value
Comparison samples


COMPARISON OF BLOOD SMPLES WITH THE STANDARD DC-BASOPHILS
Counting value (up to 2%)
2
1
0
S1
S2
S3
S4
S5
samples
Counting value
Counting value
Comparison samples



CONCLUSION:

The results obtained during the investigations of blood samples and traces collected from the tannery workers who were constantly exposed to the variety of chemicals volatile in nature and highly toxic. If they are inhaled or handled without proper gloves, the workers may suffer from various types of diseases like allergy, asthma and bronchial disorder. A detailed study on the impact of tannery environment on occupational health status of the tannery workers working in Dindigul is necessary for the health department to draft future plan to prevent the occupational health risks and also to improve the health status of the tannery workers.

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AUTHOR CONTRIBUTIONS:

Writing original draft, Research article conceptualization by KT, Reviewing, Editing, and Validation of analyzed data by NSK. All authors have read and approved the final manuscript and have consented to publication.

COMPETING INTERESTS:

The authors declare no competing interests.

DECLARATION OF HELSINKI:

The Declaration of Helsinki guidelines are not applicable to this study as it involves only data collection and no human clinical trials or medical interventions that would require ethical review.

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