HEALTH HAZARDS AMONG WORKERS OF LEATHER INDUSTRIES IN UNNAO DISTRICT- A STATISTICAL REVIEW

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ABSTRACT

The leather industry occupies a place of prominence in the Indian economy in view of its massive potential for employment, growth and exports. There has been an increasing emphasis on its planned development, aimed at optimum utilization of available raw materials for maximizing the returns, particularly from exports. The tanning industry is known to be very polluting especially through effluents high in organic and inorganic dissolved and suspended solids content accompanied by propensities for high oxygen demand and containing potentially toxic metal salt residues. Present study focuses on the health hazards on the respondents working in the tanning industry and residing near the tanning industry in Unnao. The results show that Majority of the respondents were suffering from fever, itching in the body, eyes, stomach, irritation in body, chest, eyes, feet, stomach and urinary tract and head ache i.e. 82.2%, 51.4%, 5.4%, 1.1%, 27.7%, 1.4%, 2.8%,1.9%, 0.9%, 0.7% and 11.1% respectively. 1.1% of respondents have cyst in throat and other throat problems and 1% of them were suffering from ulcers. 1.3% of respondents were complaining of watery eyes constantly. Considerable amount of respondents were suffering from skin diseases i.e. 72.3%, following with respiratory complaints cough (dry-productive) and breathlessness i.e. 56.6% and 65.5% respectively. More than half of the respondents were suffering from chest pain. Incidence of the above cases of some diseases such as irritation, itching, skin diseases, throat issues, teeth and gum problems, swelling in eyes and legs is considerably more among the respondents as they are localities' or people working in the tannery without safety measures. It can be seen that majority of them suffer with skin diseases, itching and irritation problems which appears due to either exposure to heavy metal such as chromium and consumption of chromium in food chain and water. Statistical significance of the respondents experienced health problems when compared to 200 controlled samples shows that diseases like cough, body and stomach ache, respiratory problems, irritation in eyes, body, stomach and skin, cancer, fever and Skin diseases are statistically significant when Chi-Square test was applied.

Keywords: Leather industry, tanning industry, skin diseases, respiratory problems and safety measures.

INTRODUCTION:

The leather industry is a major industry on an international scale and is of significant economic importance. The industry has received criticism on environmental grounds and the tanning industry has been viewed to be a major source of water pollution.

Tannery wastes are uniquely identified as an activity generating pollution of mixed character in the sense that both organic and inorganic constituents occur at concentrations higher than other wastes. Tanneries are thus obligated to treat effluent to a level that cause less impact on the environment. The extent of pollution from the various tanning operations in terms of its volume and characteristics, together with the various treatment methods applicable are discussed. Collectively they could form the basis for a state-of-the art technology for the treatment of effluents from the tanning industry.

The leather and leather products sector has been identified as one of the unique sectors which has the advantage of both value addition and export potential. Apart from the contribution to employment, this sector contributes significantly to total manufacturing output and exports from the country.

METHODOLOGY:

The assignment of data collection and processing was carried out from June 2015 to Aug 2015, Oct 2015 to Dec 2015. Field research was carried out in UNNAO, Indian state of Uttar Pradesh over a period of Six months. The mixed research strategy is adopted where both qualitative and quantitative techniques were considered and aimed at producing in-depth knowledge about the research. The research survey & Experimental parameters are as shown in the Table

RESEARCH SURVEY PARAMETERS

Research Methodology	Qualitative, Quantitative and Experimental techniques
Questionnaire Design	Structured questionnaire
Location	Unnao (Uttar Pradesh, India)
Total No. of Respondents	1000 – Respondents (Tannery Workers +Nearby people of tannery waste disposal sites.)
Tools Used	Statistical Package for Social Sciences(SPSS)20.0

DATA SOURCES

The present study considers both primary and secondary data. The primary data and secondary data selected for the study are:

Primary Data:

- Primary data is gathered personally from the respondents from the leather industry

- Data is collected from the residents of the locality near the leather industry.

- The analysis report of the Indian Institute of Toxicology on samples collected from ground water, tannery waste and urine samples.

Secondary Data:

- Secondary data is obtained from documentary sources like Books, Journals, Reports, Conference Proceedings, Official reports, Statistics from district offices, Web sources etc.

Sampling Design:

Convenience Sampling has been used as a sampling design for the selected study. The respondents and the samples were collected from around 123 places and some of the important places are mentioned below from where the samples were collected.

1. Akrampur Industrial Area.
2. Leather Technology Park Banthar.
3. Unnao Industrial Area Site 1.
4. Unnao Industrial Area Site 2.
5. Dahi Chauki Industrial Area.

OBJECTIVES AND HYPOTHESIS:

The prime aim of the proposed study is to perform an investigational study to understand the Environmental and Health issues developed due to the emission of toxic effluents from the tanning industry in Unnao. In order to accomplish this aim, following are the research objectives and Hypothesis:

1. To investigate and explore various factors effecting health in the people exposed to Tannery industry and Tannery waste.

2. The after effects on the human body when exposed to tannery waste disposal sites and people working in the tanneries are significantly dangerous.

Present study is the research done on the respondents residing near the tanning industryand respondents working in tanning industry in Unnao. The responses collected are by the respondents either working or residing near tanning industry. This research is based on the opinion of the respondents regarding their

health conditions. Therefore the background characteristics of the respondents are mentioned in the table below. However the research is on the diseases profile of the respondents working in industry and residing and not working in industry but residing near the locality situated near the tanning industry only
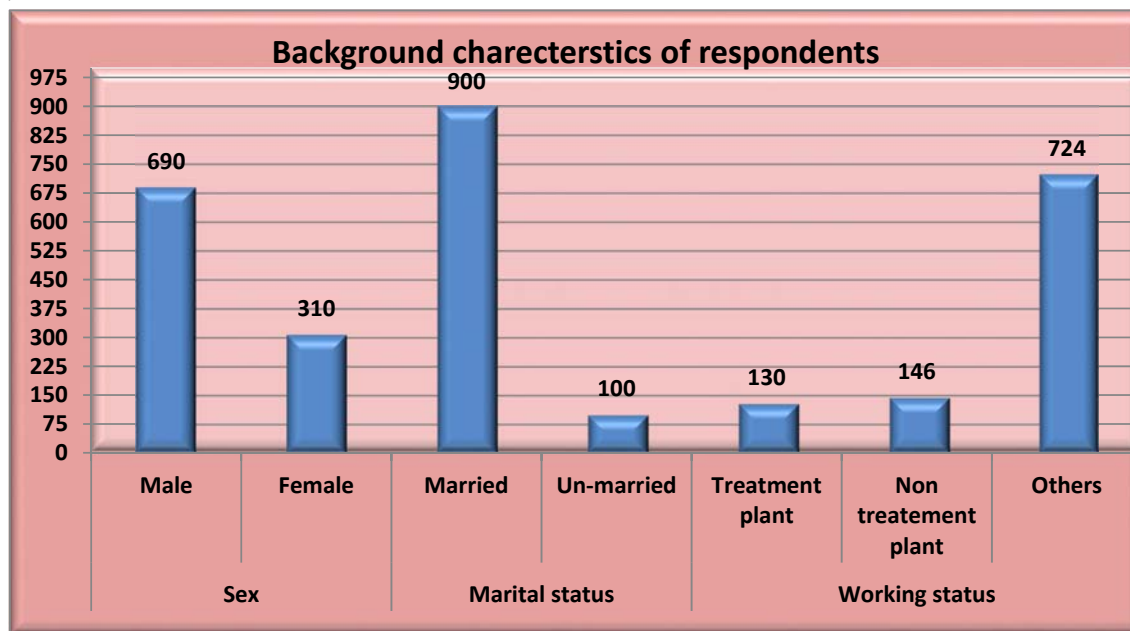
Graph No 1: Background Characteristics' of the respondents

Gender: out of total respondents 690 i.e. 69.0% respondents were males and 310 i.e. 31.0% were females

Age: the survey covered respondents of age up to 61 and above. 6.3% respondents were less than 20 years of age followed by 21 to 30 years, 21.8%, 31 to 40 years, 33.1 %, 51 to 60 years, 11.4% and 61 and above were 5%.

Marital Status: 90% of the respondents were married and only 10% were unmarried

Family Members: respondents who were single were 5.1%   followed by multiple members in their family i.e respondents 30.2 % respondents fall under the category in 2 to 4 members followed by 5 members in a family i.e. 20% and 6 members and above were 44.7 % that means almost half of the population.

Income: in the present study 43.7% respondents had less than 5000 income, 24.9% respondents had income between 5000 to 10000 followed by .9% of respondents with income between 10000 to 15000 and .3% of respondents with income more than 15000.

No. of Children: 11.3% respondent's families had no children, 34.7% respondent's families has less than 2 children followed by 22.9% families with 3 children and 31.1% with more than four children.

Working Status: in the present study 13% of respondents worked in the treatment plant in the tannery industry and 14.6% respondents worked in the tannery but not in the treatment plant. Rest 72% respondents were the people who were either working some were out of the tannery and no were related to tannery or they were people who did not work at all.

Habits of the Respondents		
Smoking		
	Frequency	Percent
Yes	212	21.2
No	788	78.8
Chewing tobacco		
Yes	506	50.6
No	494	49.4
Alcohol		
Yes	17	1.7
No	906	90.6
Sometimes	77	7.7
Diet		
Yes	851	85.1
No	149	14.9
Total	**1000**	**100**

Table No 2: Habits of the Respondents
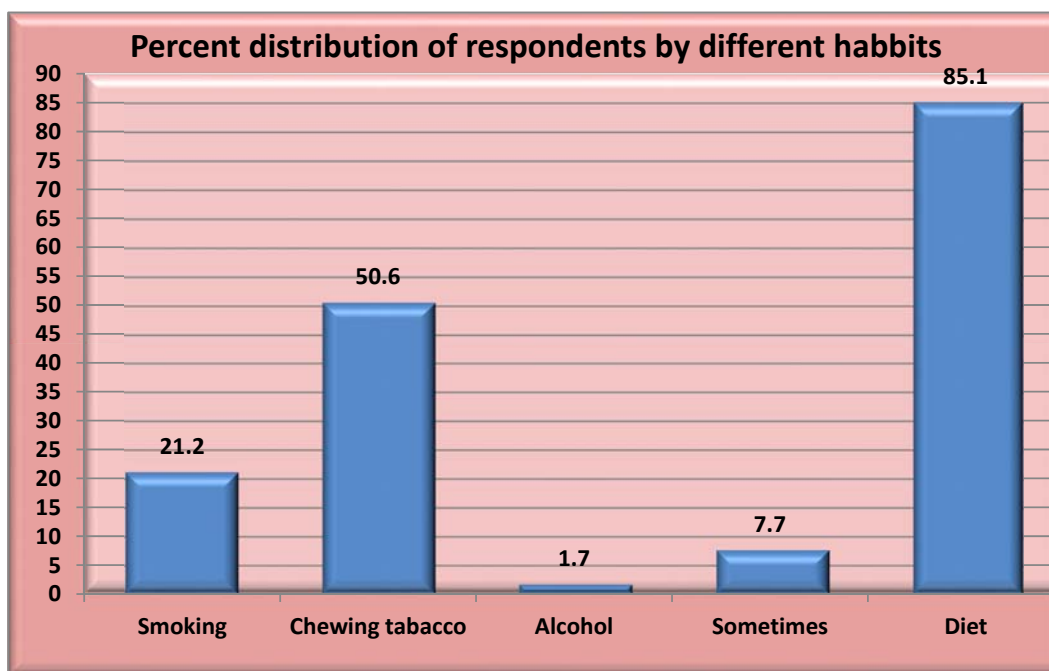
Graph No 2: Habits of the Respondents

Smoking: 21.2% respondents had the habit of smoking and 78`8% of respondents did not have the habit of smoking

Chewing Tobacco: 50.65 respondents i.e. half of the respondents were of the habit of chewing tobacco and 49.4% of respondents did not have the habit of chewing tobacco.

Alcohol: 1.7% of respondents had habit of drinking alcohol, 90.6% respondents did not have the habit of drinking alcohol whereas 7.7% respondents were of drinking alcohol sometimes.

Diseases Profile Of Respondents		
Indicators	**Number**	**Percent**
Body Ache	29	2.9
Diareah	13	1.3
Fever	822	82.2
Giddiness	11	1.1
Handicapped	6	.6
Head Ache	111	11.1
Head Ache	5	.5
Irritation In Urinary Tract	7	0.7
Irritation	277	27.7
Irritation In Chest	14	1.4
Irritation In Feet	19	1.9
Irritation In eyes	28	2.8
Irritation In Stomach	9	0.9
Itching	514	51.4
Itching In Eyes	54	5.4
Itching In Stomach	11	1.1
Joint Pain	16	1.6
Kidney Disorders	6	.6
Stomach Ache	34	3.4
Swelling	77	7.7
Swelling In Eyes	20	2.0
Swelling In Legs	12	1.2
TB	3	.3
Teeth Problem	3	0.3
Throat Infection	11	1.1
Ulcers	10	1.0
Vomiting	1	.1
Watery Eyes	13	1.3
TOTAL	**1000**	**100**

Table No 3: Profile of Infectious Diseases of Respondents

In the above table contagious diseases of the respondents are explained. 82.2% respondents suffer with fever constantly; 51.4% respondents complained about Itching and 27.7% complained about irritation in the body. 11.1 % were suffering from head ach; 7.7% from swelling in the body; 7.7% respondents were suffering from irritation in eyes, chest, feet, stomach and urinary tract. 1.1% respondents complained about giddiness and 1.1% complained about throat infection. 03% of respondents suffer from TB; 0.6% were physically handicapped; 1.3 % of respondents suffer from continuous flow of water from eyes ; 1.2% respondents were suffering from swelling in legs; and 1.1% with throat infection

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Diseases Profile of Respondents		
Indicators	**Number**	**Percent**
Chest Pain	510	51.0
Cough If Yes Dry/ Productive	452	45.2
Respiratory Complaint (Cough)	560	56.0
Respiratory Complaints - Breathlessness	655	65.5
Skin Diseases	723	72.3
Stomach Ache	838	83.8
Vomitting	266	26.6

Table No4: Profile of Diseases of Respondents

In the present study 72.3% respondents were suffering from Skin Diseases; 56% complained of cough both dry and productive; 51% of respondents complained about Chest Pain; 65.5% respondents complained about breathlessness; 83.8% suffered with Stomach Ache and 26.6% with Vomiting.
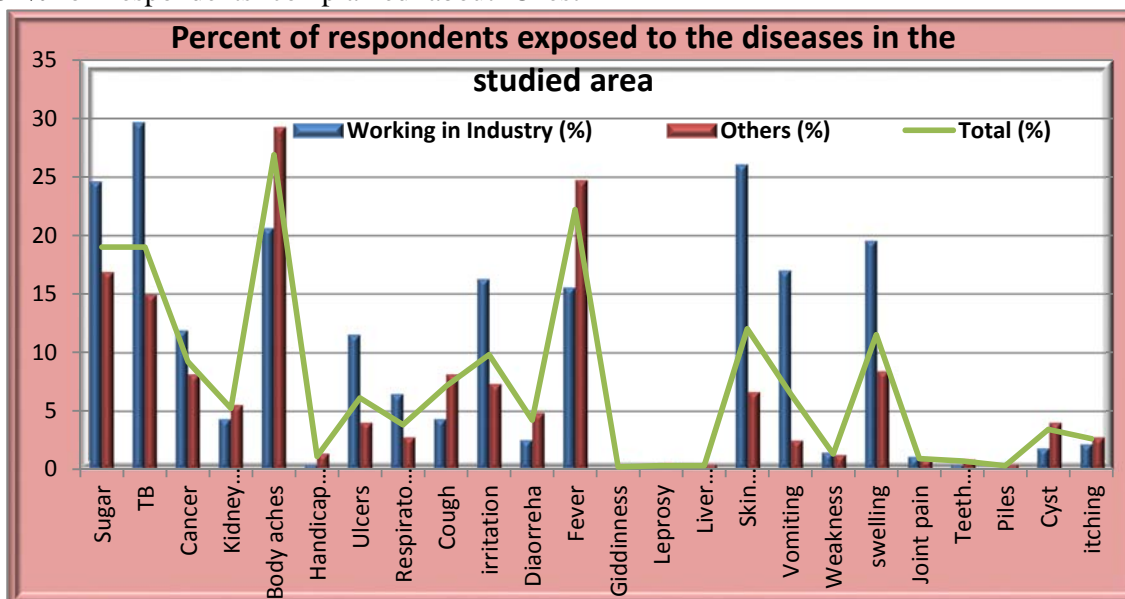
Graph No 4: Profile of Diseases of Respondents

		Background characteristics by type of work							
		Number				**Percent**			
		Working in Treatment plant (N=130)	**Not working in treatment plant (N=146)**	**Others (N=274)**	**Total (N=1000)**	**Working in Treatment plant (N=130)**	**Not working in treatment plant (N=146)**	**Others (N=274)**	**Total (N=1000)**
Sex	Male	121	140	429	690	93.1	95.9	59.3	69
	Female	9	6	295	310	6.9	4.1	40.7	31
Age	Less than 20	12	6	45	63	9.2	4.1	6.2	6.3
	Age 21 to 30	47	35	136	218	36.2	24.0	18.8	21.8

	Age 31 to 40	37	64	230	331	28.5	43.8	31.8	33.1
	Age 41 to 50	22	28	174	224	16.9	19.2	24.0	22.4
	Age 51to 60	9	12	93	114	6.9	8.2	12.8	11.4
	Age 61 and above	3	1	46	50	2.3	0.7	6.4	5.0
Marital status	Married	104	136	660	900	80.0	93.2	91.2	90.0
	Un-married	26	10	64	100	20.0	6.8	8.8	10.0
Family members	Single Member	1	5	45	51	0.8	3.4	6.2	5.1
	2 to 4 members	31	53	218	302	23.8	36.3	30.1	30.2
	Five members	26	37	137	200	20.0	25.3	18.9	20.0
	6 and above members	72	51	324	447	55.4	34.9	44.8	44.7
no of children	None	13	14	86	113	46.2	58.9	43.8	46.3
	One	41	62	244	347	21.5	18.5	30.2	27.4
	two	26	34	169	229	23.8	13.0	17.5	17.7
	More than three	50	36	225	311	8.5	9.6	8.4	8.6
Habits	Tobacco	75	91	340	506	57.7	62.3	47.0	50.6
	Regular alcohol	2	3	12	17	1.5	2.1	1.7	1.7
	Sometimes alcohol	24	10	43	77	18.5	6.8	5.9	7.7
	Smoking	27	59	126	212	20.8	40.4	17.4	21.2
Diet	Yes	89	122	640	851	68.5	83.6	88.4	85.1
Working period	Less than one year	3	40	NA	43	2.3	27.4	NA	15.6
	1-5 years	50	62	NA	112	38.5	42.5	NA	40.6
	6-10 years	39	26	NA	65	30.0	17.8	NA	23.6
	11-15 years	24	8	NA	32	18.5	5.5	NA	11.6
	16 and above	14	10	NA	24	10.8	6.8	NA	8.7
child dead	None	60	86	317	463	46.2	58.9	43.8	46.3
	One	28	27	219	274	21.5	18.5	30.2	27.4
	two	31	19	127	177	23.8	13.0	17.5	17.7
	More than three	11	14	61	86	8.5	9.6	8.4	8.6

Table No 5: Cross Tabulation of Background Characteristics on the Basis of Type of Work of the Respondents

Interpretation: Table NO 5 shows the cross tabulation of Background characteristics of the Respondents such as gender, Age, Marital Status, No of Family members, No of children in the Family, Habits, Diet and if they are working in the tannery the working period. In this table it is clearly tabulated and differentiated about the total working population and non workers in the tannery with respect to their background details. The No. of children dead in the family of the working respondents and non working respondents in the tanneries is also mentioned in detail. It can be interpreted for the children dead from the families of respondents working int the tannery is more than 50%. Here others column belongs to the respondents who do some work

but they not work in the tannery but they are the residents of the locality where the tannery is situated. Therefore the effect on them sue to water, atmosphere and soil is also considered.

Disease profile of respondents by type of work							
Type of disease	**Number**				**Percent**		
	Working in Treatment plant (N=130)	**Not working in treatment plant (N=146)**	**Others (N=274)**	**Total (N=1000)**	**Working in Treatment plant (N=130)**	**Not working in treatment plant (N=146)**	**Others (N=274)**	**Total (N=1000)**
Fever	101	126	595	822	77.7	86.3	82.2	82.2
Itching	63	63	388	514	48.5	43.2	53.6	51.4
Irritation	37	30	210	277	28.5	20.5	29.0	27.7
Head Ache	15	19	77	111	11.5	13.0	10.6	11.1
Swelling	12	6	59	77	9.2	4.1	8.1	7.7
Irritation In Eyes	10	2	16	28	7.7	1.4	2.2	2.8
Diorrreha	1	2	10	13	0.8	1.4	1.4	1.3
Body Ache	2	1	26	29	1.5	0.7	3.6	2.9
Swelling In Eyes	13	0	7	20	10.0	0.0	1.0	2.0
Head Ache	0	1	4	5	0.0	0.7	0.6	0.5
Irritation In Urinary Tract	0	0	7	7	0.0	0.0	1.0	0.7
Itching In Stomach	1	2	8	11	0.8	1.4	1.1	1.1
Stomach Ache	1	4	29	34	0.8	2.7	4.0	3.4
Irritation In Stomach	1	0	8	9	0.8	0.0	1.1	0.9
Irritation In Feet	3	1	15	19	2.3	0.7	2.1	1.9
Giddiness	0	2	9	11	0.0	1.4	1.2	1.1
Ulcers	1	2	7	10	0.8	1.4	1.0	1.0
Irritation In Chest	1	2	11	14	0.8	1.4	1.5	1.4
Throat Infection	0	0	11	11	0.0	0.0	1.5	1.1
Joint Pain	0	5	11	16	0.0	3.4	1.5	1.6
Tb	0	3	0	3	0.0	2.1	0.0	0.3
Kidney Disorders	0	1	5	6	0.0	0.7	0.7	0.6
Vomiting	1	0	0	1	0.8	0.0	0.0	0.1
Swelling In Legs	1	0	11	12	0.8	0.0	1.5	1.2
Teeth Problem	2	0	1	3	1.5	0.0	0.1	0.3

Itching In Eyes	18	8	28	54	13.8	5.5	3.9	5.4
Handicapped	0	1	5	6	0.0	0.7	0.7	0.6
Watery Eyes	1	1	11	13	0.8	0.7	1.5	1.3

Table No 6: Cross Tabulation of Profile of Infectious Diseases of the respondents on the basis of type of work of respondents.

Disease profile of respondents by type of work								
Type of disease	Number				Percent			
	Working in Treatment plant (N=130)	Not working in treatment plant (N=146)	Others (N=274)	Total (N=1000)	Working in Treatment plant (N=130)	Not working in treatment plant (N=146)	Others (N=274)	Total (N=1000)
Chest Pain	68	79	363	510	52.3	54.1	50.1	51.0
Cough If Yes Dry/ Productive	56	69	327	452	91.8	95.8	94.2	94.2
Respiratory Complaint Cough	75	82	403	560	57.7	56.2	55.7	56.0
Respiratory Complaints – Breathlessness	99	83	473	655	76.2	56.8	65.3	65.5
Skin Diseases	96	98	529	723	73.8	67.1	73.1	72.3
Stomach Ache	113	88	637	838	86.9	60.3	88.0	83.8
Vomiting	18	34	214	266	13.8	23.3	29.6	26.6

Table No 7: Cross Tabulation of Profile of Skin Diseases, Respiratory problem and Gastro intestinal issues of the respondents on the basis of type of work of respondents

Interpretation: Table no 10 and Table No 11 gives the detailed idea of health issues among respondents both working in the tannery and not working in the tannery. Here others column belongs to the respondents who do some work but they not work in the tannery but they are the residents of the locality where the tannery is situated. Around 48.5% respondents working in the tannery were suffering from Itching; 29% of the respondents working in the tannery were suffering from irritation in the body. Around 10% of them complained of swelling in the body. 73% of the respondents working in the tannery were suffering from skin diseases. 57.7% of respondents working in the industry had respiratory issues in which cough was their major problem and majority of the respondents around 95.8% of them has productive cough. Around 76.2% of them complained about breathlessness and *6.(% complained about stomach ache.

Statistical significance of respondents experienced health problem by type of work								
	Working in Industry (N=276)	Percent	Others (N=724)	Percent	Total (N=1000)	Percent	Pearson's R	Chi-square (p-value)
Diorrreha	3	1.1	10	1.4	13	1.3	0.772	**
Fever	227	82.2	595	82.2	822	82.2	1.000	0.981
Giddiness	2	0.7	9	1.2	11	1.1	0.536	**
Handicaped	1	0.4	5	0.7	6	0.6	0.685	**

Head Ache	28	89.9	46	93.6	74	92.6	0.044	0.041
Irritation	85	30.8	259	35.8	344	34.4	0.157	0.139
Itching	138	50.0	413	57.0	551	55.1	0.047	0.045
Joint Pain	5	1.8	11	1.5	16	1.6	0.779	**
Kidney Disorders	1	0.4	5	0.7	6	0.6	0.685	**
Respiratory Complaint Cough	47	83.0	120	83.4	167	83.3	0.924	0.863
Skin Diseases	194	70.3	529	73.1	723	72.3	0.385	0.380
Swelling	30	10.9	76	10.5	106	10.6	0.909	0.864
Tb	3	1.1	0	0.0	3	0.3	0.021	**
Teeth Problem	2	0.7	1	0.1	3	0.3	0.186	**
Throat Infection	0	0.0	11	1.5	11	1.1	0.041	**
Ulcers	3	1.1	7	1.0	10	1.0	1.000	**
Vomiting	53	19.2	214	29.6	267	26.7	0.001	**0.001**

Chi-square test was used to test significance for odds ratio. Control group from Working in Industry is taken as reference category. (p<0.05)

** Cells have expected count less than 5.

Table No8 : **Statistical significance of respondents experienced health problem on the basis and type of work**

A Chi-Square dependency test was carried out and the results show that the calculated values are less than the table values at 5% Level of Significance. Table No 8 shows the statistical out come of the diseases experienced by the respondents working in the tannery. Here it is shown that diseases like Itching in the body and other body parts, irritation in the body, head ache, skin diseases, and vomiting are highly significant.

Statistical significance of respondents experienced health problems by residential status								
	Residents (N=1000)	**Percent**	**Non residents (N=200)**	**Percent**	**Total (N=1200)**	**Percent**	**Pearson's R**	**Chi-square (p-value)**
Diarrhea	13	1.3	9	4.5	22	1.8	-0.089	**0.002**
Fever	822	82.2	22	11.0	844	70.3	0.581	**0.000**
Giddiness	11	1.1	5	2.5	16	1.3	-0.045	0.115
Handicapped	6	0.6	1	0.5	7	0.6	0.005	0.865
Head Ache	74	7.4	29	14.5	103	8.6	-0.094	**0.001**
Irritation	344	34.4	12	6.0	356	29.7	-0.232	**0.000**
Itching	550	55.0	23	11.5	573	47.8	-0.325	**0.000**
Joint Pain	16	1.6	9	4.5	25	2.1	-0.076	**0.009**
Kidney Disorders	6	0.6	4	2.0	10	0.8	-0.057	0.047
Respiratory Complaint Cough	167	16.7	16	8.0	183	15.3	0.090	**0.002**
Skin Diseases	723	72.3	23	11.5	746	62.2	0.467	**0.000**
Swelling	106	10.6	22	11.0	128	10.7	0.005	0.867
Tb	3	0.3	4	2.0	7	0.6	-0.083	**
Teeth Problem	3	0.3	2	1.0	5	0.4	-0.040	**

Throat Infection	11	1.1	6	3.0	17	1.4	-0.060	0.038
Ulcers	10	1.0	5	2.5	15	1.3	-0.050	0.081
Vomiting	267	26.7	22	11.0	289	24.1	-0.137	**0.000**

Chi-square test was used to test significance for odds ratio. Control group from residents in the same area is taken as reference category. (p<0.05)
** Cells have expected count less than 5.

Table No 9: **Statistical significance of respondents experienced health problems on the basis of residential status**

A Chi-Square dependency test was carried out and the results show that the calculated values are less than the table values at 5% Level of Significance. This table broadly shows us the highly significance diseases which when compare to the controlled population are significant. Diseases such as fever, itching, irritation, head ache, diarrhea, ulcers, throat infection or throat problems, joint pain, skin diseases, Tb, Respiratory complaints are highly significant

Statistical significance of Habits of the respondents							
	Working in Industry (N=276)	**percent**	**Others (N=724)**	**Percent**	**Total (N=1000)**	**Percent**	**Pearson's R**	**Chi-square (p-value)**
Smoking	86	31.2	126	17.4	212	21.2	0.150	0.000
Tobacco	166	60.1	340	47.0	506	50.6	0.118	0.000
Yes, Alcohol	5	1.8	12	1.7	17	1.7		
No, Alcohol	237	85.9	669	92.4	906	90.6	-0.093	0.003
Sometimes, Alcohol	34	12.3	43	5.9	77	7.7		
Diet	211	76.4	640	88.4	851	85.1	-0.150	0.000

Table No 10: Statistical significance of Habits of the respondents

A Chi-Square dependency test was carried out and the results show that the calculated values are less than the table values at 5% Level of Significance. Here all the habits such as smoking, drinking alcohol, chewing tobacco and the diet of the respondents are highly significant amount the working population in tanneries.

CONCLUSION:
The main reason for the development and growth of the leather industry in the country is its large animal population. India enjoys nearly 10% of the total global availability of raw hides and skins which are the basic raw material for the leather industry. All the diseases discussed above are more likely to appear due to the consumption of heavy metals such as Chromium which is a common effluent from the tannery industry. An important health risk factor for the tannery workers is occupational exposure to chromium, which is used as a basic tanning pigment. The work in the leather supply chain is risky and hazardous, as it entails working with chemicals. The toxic chemicals have a major negative impact on the health of the people working in the tanneries. Tannery workers often suffer from fever, eye inflammation, skin diseases and lung cancer. The use of chromium often implies serious human and labour rights violations, as tanneries regularly ignore the necessary health and safety guidelines. Furthermore, the semisolid effluent of leather production diffuses toxic gases. The leather workers often lack sufficient protection against these toxic gases. In December 2015, three leather workers died and two workers were hospitalized after inhaling toxic gases from the leather effluent in a leather complex in Kolkata. Generally, workers are not sufficiently protected and trained to ensure their health and safety. Workers report that they suffer from frequent bouts of fever, severe body, bone, joint and muscle pain, severe headaches, nausea and reproductive health problems. Other

common problems are eye irritation and coughing. Helpers and other workers carrying heavy loads of hides often suffer from back pain, excessive fatigue and musculoskeletal injuries. Moreover, some workers have to quit their job because of chronic body pain, reproductive health problems and other health issues related to the heavy work in the tanneries. Present results confirm the previous findings of increased morbidity among tannery workers in the form of respiratory diseases, dermal and ocular. Respondents mentioned here are both working in tannery as well as nonworking in tannery but residents of the locality near the tannery. There is need for providing awareness and training programs on sustainable leather production. There is need for the industry to identify and promote actions that are aimed at reducing the amount and/or toxicity of chemicals. This will need prudent chemical management practices in the leather-tannery industry to help minimize the quantities and risks of the chemicals being used.

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