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Health Hazards among Children Residing Near Leather Industries in UNNAO District- A Statistical Review

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Abstract: ***Leather industry in India has its own socio economic status. This industry gives employment and handsome economic status to our country. Present study focuses on the impact of tanning industries on the health of the children working or residing near the tanneries. In this research 1000 respondents were taken into consideration. The results show that Majority of the children suffer with fever i.e 49.4% and 43.3% suffered with stomach ache. Approximately 14% children's suffer with cough constantly and 6.9 with diarrheal Around 4% children complained about imitation in stomach, eyes and feet of 2.3% children suffered with swelling in eyes joint and mouth 9.7% children suffer with skin diseases, 3.6% children suffer with itching , 5 children suffer with cancer, 8 with TB and 2 of them complained about nails getting separated from fingers which is significantly different. Statistical significance of the children 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, TB, fever and Skin diseases are statistically significant when Chi-Square test was applied.***

I. INTRODUCTION

Leather Industry has gained high Socio-economic relevance in India. Indian Leather sector has contributed significant economic growth by providing Job opportunities. Leather Industry in India is spread over more in the unorganized sector. The small scale, cottage and artisan sectors account for over 90% of the total production. Today, the industry ranks 8th in the export trade in terms of foreign exchange earnings of the country. Leather industry occupies a place of prominence in the Indian Economy, by contributing 2 billion US dollars in terms of export, and its share in world trade is 2% Leather industry is providing employment to nearly 2.5 million people and the majority of tanneries fall under small and medium scale enterprises (Taylor, 2005).

A Tannery is an Industry which has converted Raw skin and Hides in to leather. The tanning industry is one of the oldest industries in the world. In beginning, skin obtained from hunting and livestock breeding could be used for clothing or tents. But now hides are rarely used in their own state due to the temperature variations. In low temperature hide become hard and rigid and in high temperature hide become flaccid and soft. The Tanning eliminate these problems using different agents of animal, vegetable, mineral or synthetic origin and convert the hide in to leather.

Leather was used even from the time of God. In Hindu epic Lord Shiva used elephant skin as cloth and was used to sit on a tiger's skin for his deep meditation. (Prasad P.R. and Rajanikanth . G. Development of Scheduled Caste Leather Artisan Profile] Problems and Prospects, Discovery Publishing House, New Delhi, 1991. P^{89}). Tanning is the process of transforming animal skins (a natural renewable resource) to leather (a market material used in the manufacture of a wide range of products).

Tanning is claimed to be the second oldest profession in the world. In ancient times, tanning was considered as a noxious trade. However the industry has evolved with time. The leather industry is now recognized as a major industry of great economic importance on an international scale producing a host of products in one of the world's finest natural materials. Tanning industry is sometimes criticized on environmental grounds, although the only other viable alternative of dumping the putrefying hides and skins can be more hazardous and can cause even more severe environmental damage.

II. 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

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III. 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

A. Data Sources

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

1) Primary Data

a) Primary data is gathered personally from the respondents from the leather industry

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

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

2) Secondary Data

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

3) 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.

a) Akrampur Industrial Area.

b) Leather Technology Park Banthar.

c) Unnao Industrial Area Site 1.

d) Unnao Industrial Area Site 2.

e) Dahi Chauki Industrial Area

B. 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 Children residing near the 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 and their children. Therefore the background characteristics of the respondents are mentioned in the table below. However the research is on the diseases profile of the children only

Background Characteristics Of The Respondents

Category	Indicator	Frequency	Percent
Gender	Male	690	69.0
	Female	310	31.0
Age	Less than 20	63	6.3
	21 to 30	218	21.8
	31 to 40	331	33.1
	41 to 50	224	22.4

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	51 to 60	114	11.4
	61 and above	50	5.0
Marital status	Married	900	90.0
	Un-married	100	10.0
Family members	Single Member	51	5.1
	2 to 4 members	302	30.2
	Five members	*-	20.0
	6 and above	447	44.7
Income	Less than 5000	437	43.7
	5000 to 10000	249	24.9
	10000 to 15000	9	.9
	More than 15000	3	.3
	DK	302	30.2
Number of children	None	113	11.3
	less than two	347	34.7
	three children	229	22.9
	More than four children	311	31.1
Working status	Working in Treatment plant	130	13.0
	Not working in treatment plant	146	14.6
	Others	724	72.4
Total		1000	100

Table No 2: 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 then 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 between10000 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.

Disease Profile In Children		
Indicators	Number	Percent
Body Ache	18	1.8
Breathlessness	13	1.3
Cancer	5	0.5

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Chest Pain	48	4.8
Cough	140	14.0
Diarrhea	69	6.9
Death Due To	2	0.2
Fever	494	49.4
Giddiness	8	0.8
Handicapped	7	0.7
Head Ache	104	10.4
Irritation In Feet	10	1.0
Irritation In Eyes	6	0.6
Irritation In Face	14	1.4
Irritation In Stomach	9	.9
Itching	36	3.6
Itching In Eyes	5	0.5
Itching In Stomach	8	0.8
Less Growth In Children	1	0.1
Mentally Ill	1	0.1
Nails Of The Fingers Gets Separated	2	0.2
Pain In Eyes	3	0.3
Pain In Hands	4	0.4
Piles	7	0.7
Respiratory Problems	9	0.9
Skin Diseases	97	9.7
Stomach Ache	433	43.3
Swelling In Eyes	9	0.9
Swelling In Joints	1	0.1
Swelling In Mouth	13	1.3
TB	8	0.8
Teeth Problem	3	0.3
Ulcers	3	O.3
Ulcers In Mouth	5	0.5
Vomiting	30	3.0
Weakness	26	2.6
Children Died		
None	463	46.3
1	274	27.4
2	177	17.7
3	75	7.5
4	8	0.8
5	3	0.3
Total	1000	100

Table No 3: Disease Profile of Children

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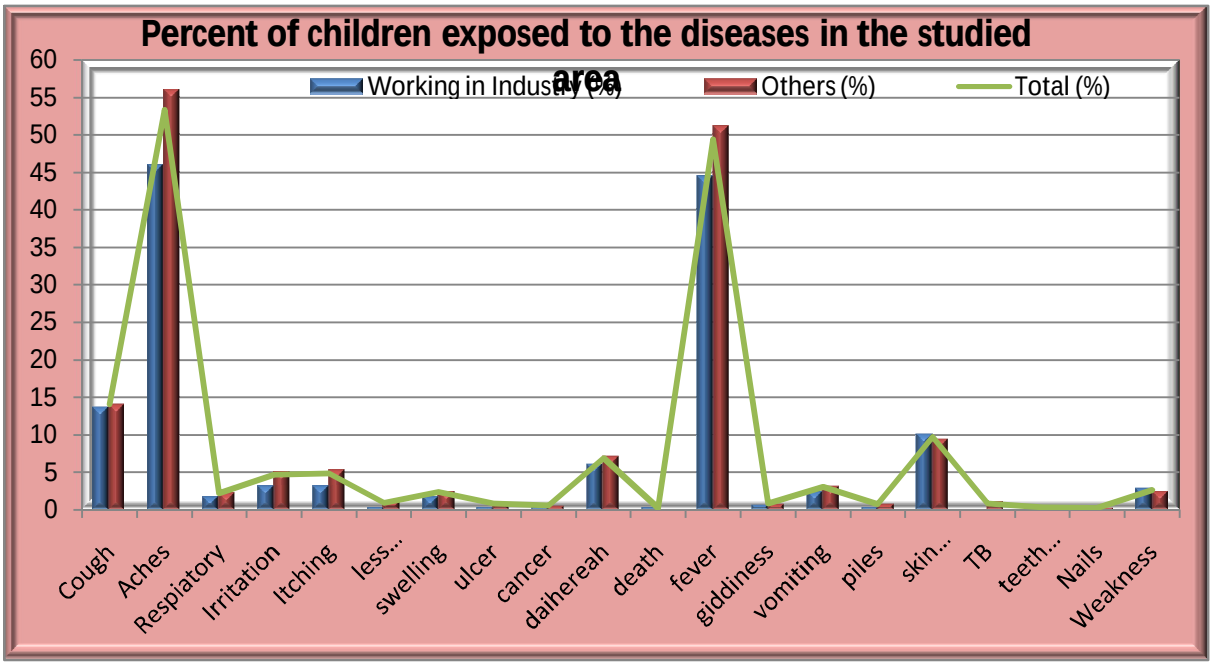

Graph No 1: Disease Profile of Children

In the present study the diseases profile of the children points out that 49.4% children suffer with fever constantly. 43.3% children suffer from stomach ache followed by 6.9% with diarehhea and 3.0% of them suffer with vomiting. 14% of children suffer with cough, and 10.4% of them suffer with head ache. 9.7% of the children suffer with skin diseases. Around 0.9% of them suffer with respiratory problems followed by 1.3% children with breathlessness. The important thing to be noticed here is 0.5% chindren i.e. 5 children were suffering from cancer and 0.8% of them were suffering from TB, 0.7% of children were handicapped. Around 3.9% of them complained about irritation in feet, eyes, face, stomach and around 4.9% complained about itching in eyes, stomach etc. around 2.3% children complained about Swelling in eyes, mouth and joints. Around 0.2% children suffered with a severe disorder in which their nails gets separated from the fingers. Around 0.3% complained of teeth problems and swelling in gums and 0.8% suffered with ulcers in mouth and stomach.

In some of the respondent's families children were dead either soon after death or after some months or years. Above table also explains about percentage of children dead in the family. The tables shows that half of them were of the opinion that no death of children occurred in their families followed by 1 child's death i.e. 27.4% ; 2 deaths i.e. 17.7% ; 3 deaths 7.5% and 4 deaths and 5 deths of children in the family i.e. 0.8 and 0.3 respectively.

Number of children experienced health problem 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)
Body Ache	0	2	16	18	0.0	1.4	2.2	1.8
Breathlessness	1	2	10	13	0.8	1.4	1.4	1.3
Cancer	0	1	4	5	0.0	0.7	0.6	0.5
Chest Pain	2	8	38	48	1.5	5.5	5.2	4.8
Cough	27	11	102	140	20.8	7.5	14.1	14.0
Diarrhea	9	8	52	69	6.9	5.5	7.2	6.9
Death Due To	0	1	1	2	0.0	0.7	0.1	0.2
Fever	73	50	371	494	56.2	34.2	51.2	49.4

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Giddiness	1	1	6	8	0.8	0.7	0.8	0.8
Handicapped	0	1	6	7	0.0	0.7	0.8	0.7
Head Ache	4	4	18	26	3.1	2.7	2.5	2.6
Irritation In Eyes	1	0	5	6	0.8	0.0	0.7	0.6
Irritation In Face	3	0	11	14	2.3	0.0	1.5	1.4
Irritation In Feet	0	3	7	10	0.0	2.1	1.0	1.0
Irritation In Stomach	0	1	8	9	0.0	0.7	1.1	0.9
Itching	2	5	29	36	1.5	3.4	4.0	3.6
Itching In Eyes	1	1	3	5	0.8	0.7	0.4	0.5
Itching In Stomach	0	0	8	8	0.0	0.0	1.1	0.8
Less Growth In Children	0	0	1	1	0.0	0.0	0.1	0.1
Mentally Ill	0	0	1	1	0.0	0.0	0.1	0.1
Nails Of The Fingers Gets Separated	0	0	2	2	0.0	0.0	0.3	0.2
Pain In Eyes	0	1	2	3	0.0	0.7	0.3	0.3
Pain In Hands	0	0	4	4	0.0	0.0	0.6	0.4
Piles	1	0	6	7	0.8	0.0	0.8	0.7
Respiratory Problems	2	0	7	9	1.5	0.0	1.0	0.9
Skin Diseases	12	16	69	97	9.2	11.0	9.5	9.7
Stomach Ache	57	43	333	433	43.8	29.5	46.0	43.3
Swelling In Eyes	1	0	8	9	0.8	0.0	1.1	0.9
Swelling In Joints	0	0	1	1	0.0	0.0	0.1	0.1
Swelling In Mouth	3	1	9	13	2.3	0.7	1.2	1.3
Tb	0	0	8	8	0.0	0.0	1.1	0.8
Teeth Problem	0	1	2	3	0.0	0.7	0.3	0.3
Ulcers	0	1	2	3	0.0	0.7	0.3	0.3
Ulcers In Mouth	0	0	5	5	0.0	0.0	0.7	0.5
Vomiting	1	6	23	30	0.8	4.1	3.2	3.0
Weakness	4	4	18	26	3.1	2.7	2.5	2.6

Table No 4: Cross Tabulation of Number of children experienced health problem on the basis of type of work of Respondents

C. Interpretation

Table no 8 gives the detailed idea of health issues in among children from the families of respondents both working in the tannery and not working in the tannery. Majority of the children i.e. 56.2% were suffering from fever constantly**.** . 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. There are some peculiar health issues which can be seen in the children of respondents working in tannery or not working in tannery but residing near the tannery. Although the percentage of such diseases is low but it can be noticed that no such health issues were found in the controlled population such as around 0.5% children were suffering from a disease in which nails of the fingers used to get separated. It can be seen that around 10% of the children suffered with skin diseases. Around 3% complain of itching in the body and different parts. Around 3.5% complained about irritation in the body and different body parts which is not a negligible percent as per the research.

Table: Statistical significance of children 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)
Cough	38	13.8	102	14.1	140	14.0	-0.004	0.896
Aches	127	46.0	406	56.1	533	53.3	0.090	0.004
Respiratory	5	1.8	17	2.3	22	2.2	0.016	0.605
Irritation	9	3.3	37	5.1	46	4.6	0.039	0.212

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Itching	9	3.3	39	5.4	48	4.8	0.044	0.160
Less Growth	1	0.4	8	1.1	9	0.9	0.035	**
Swelling	5	1.8	18	2.5	23	2.3	0.020	0.525
Ulcer	1	0.4	7	1.0	8	0.8	0.030	0.337
Cancer	1	0.4	4	0.6	5	0.5	-0.012	**
Diarrhea	17	6.2	52	7.2	69	6.9	-0.018	0.568
Death	1	0.4	1	0.1	2	0.2	0.022	**
Fever	123	44.6	371	51.2	494	49.4	-0.060	0.059
Giddiness	2	0.7	6	0.8	8	0.8	-0.005	**
Vomiting	7	2.5	23	3.2	30	3	-0.017	0.596
Piles	1	0.4	6	0.8	7	0.7	-0.025	**
Skin Disease	62	22.5	69	9.5	131	13.1	0.171	0.000
Tb	0	0.0	8	1.1	8	0.8	-0.055	**
teeth problem	1	0.4	2	0.3	3	0.3	0.007	**
Nails	0	0.0	2	0.3	2	0.2	-0.028	**
Weakness	8	2.9	18	2.5	26	2.6	0.012	0.714
Children died								
None	146	52.9	317	43.8	463	46.3	0.033	0.009
One	55	19.9	219	30.2	274	27.4		
Two	50	18.1	127	17.5	177	17.7		
More than three	25	9.1	61	8.4	86	8.6		
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 No 5: Statistical significance of children belonging to respondent's family with health problems on the basis of 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. Here this research shows that the diseases like body ache, head ache, ache I hands and legs, stomach ache is significant according to the chi-square test. This research also shows that the children belonging to the famility of the respondents suffer with skin diseases which is highly significant.

Statistical Significance Of Children Experienced Health Problem By Type Of Residence								
	Residents (N=1000)	Percent	Non residents (N=200)	Percent	Total (N=1200)	Percent	Pearson's R	Chi-square (p-value)
Cough	140	14.0	7	3.5	147	12.3	0.119	0.000
Aches	533	53.3	21	10.5	554	46.2	-0.320	0.000
Respiratory	22	2.2	16	8.0	38	3.2	0.123	0.000
Irritation	46	4.6	21	10.5	67	5.6	0.096	0.001
Itching	48	4.8	11	5.5	59	4.9	0.012	0.676
Less Growth	9	0.9	2	1.0	11	0.9	0.004	0.892
Swelling	23	2.3	6	3.0	29	2.4	0.017	0.556
Ulcer	8	0.8	2	1.0	10	0.8	0.008	**

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Cancer	5	0.5	5	2.5	10	0.8	-0.082	0.005
Diarrhea	69	6.9	7	3.5	76	6.3	0.052	0.072
Death	2	0.2	6	3.0	8	0.7	-0.128	**
Fever	494	49.4	15	7.5	509	42.4	0.316	0.000
Giddiness	8	0.8	3	1.5	11	0.9	-0.027	**
Vomiting	30	3.0	8	4.0	38	3.2	-0.021	0.461
Piles	7	0.7	1	0.5	8	0.7	0.009	**
Skin Disease	131	13.1	12	6.0	143	11.9	0.082	0.005
Tb	8	0.8	15	7.5	23	1.9	-0.182	0.000
Teeth Problem	3	0.3	2	1.0	5	0.4	-0.040	**
Nails	2	0.2	2	1.0	4	0.3	-0.052	**
Weakness	26	2.6	8	4.0	34	2.8	-0.031	0.276
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 6: Statistical Significance of Children with health issues in both residents and non residents (Controlled Population)

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 shows the statistical outcome of the diseases in children both residing near tannery and the children not residing near tannery. This table shows that diseases like cough, ache such as stomach ache, body ache, pain in hand and legs and head ache, Respiratory problems such as breathlessness, irritation in the body and body parts, itching in the body and body parts, cancer, fever, skin diseases are highly significant. Therefore it can concluded that children suffering with such diseases is not normal compared to the children residing away from the tannery.

IV. CONCLUSION

Heavy metal pollution of soil and water is a significant environmental problem and has a negative impact on human health and agriculture. It is a major environmental problem facing the modern world. The global heavy metals are increasing in the environment due to an increase in number of industries.

Untreated industrial effluents are highly toxic to the biota and become a threat to biosphere if not taken care of. A suitable method is needed to eliminate or reduce pollution arising from such industrial processes. Many industrial waste water contain heavy metals like cadmium, lead, zinc, cobalt and chromium. Among the heavy metals, chromium plays a major role in polluting our water and soil environment.

Leather tanning is the process of converting raw hides or skins into leather. Tanning is essentially the reaction of collagen fibers in the hide with tannins, chromium and other chemical agents. So in the present study, tannery effluent was taken in different concentrations and used to assess the plant growth; microbial means of detoxifying Chromium (VI) to Chromium (III), a non-toxic form was also analysed in tannery effluent as it is an efficient, cost effective and eco friendly strategy. Recent advances have been made in understanding metal microbe interaction and their application for metal detoxification. The leather industry has immense effects on the health of the people residing near the tannery as it enters the food chain when untreated solid waste is dumped in the agricultural ground similar when the untreated effluent is mixed with drinking water. Therefore the authorities should be careful before dumping the untreated waste from leather industry.

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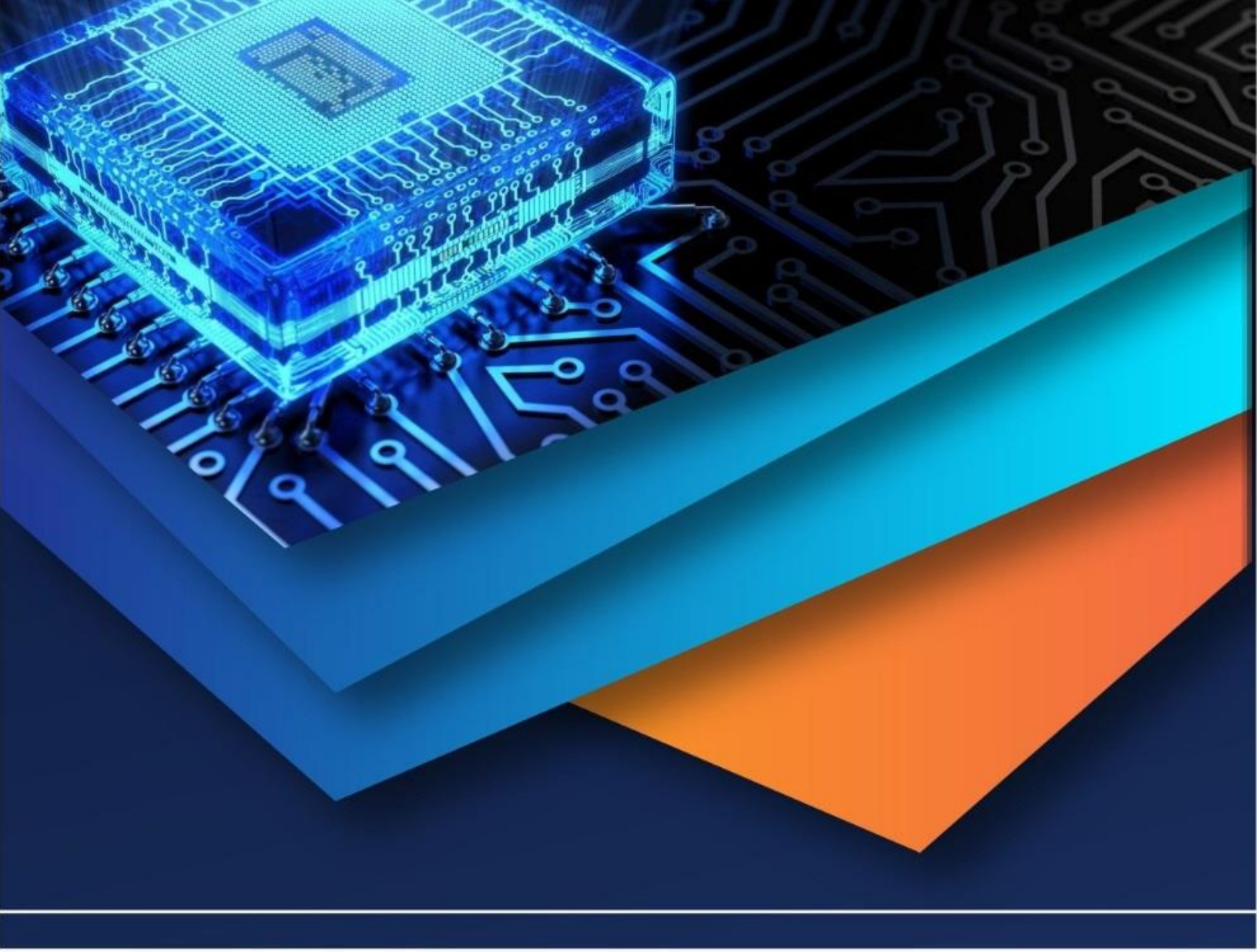

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