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The Toxicological Effect of Cement Dust on Hepatic and Renal Functions of Cement Factory Workers

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Abstract: **Production processes of cement lead to production of dust in which workers hitherto inhale the dust which found to be inimical to their health. This study evaluates hepatic and renal function indices of about 60 volunteers workers of Obajana cement factory. Collection and test techniques were straight forward and sufficient volume of blood for complete profile was readily available from most individual volunteers. Our data in the result tables document the similarity between exposed workers in different unit/sections: crusher worker CW, kiln workers KW, milling worker MW, bagging workers, BW, and Loading workers, LW and unexposed(control) workers of Obajana Cement Factory with several important distinctions. However, all the human blood used with Ethical permit in this work as unexposed and exposed are from healthy, non hydrated and were in good body condition. The results indicate elevation in Aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phospatase (ALP), creatinine (CREA), urea (UREA) and slight increase in sodium (Na^+), potassium (K^+), bicarbonate (HCO_3^-) in exposed as compared to unexposed workers The study further showed significant increase in AST, ALT, ALP, CREA, Na^+, K^+ and HCO_3^- in workers exposed to dust for longer period of exposure.this results indicate advance effect of cement dust on human health if is not check and proper control.**

Keywords: **Exposed, unexposed, carcinogenesis, liver function, cement dust, factory workers.**

1. INTRODUCTION

Cement factories are considered as one of major pollution problem because of dust and particulate matter emitted at various steps of cement production (Ogunbileje *et al.*, 2010). According to Serda(2010) air pollution generated by the cement manufacturing process consists primarily of alkaline particulates from the raw and finished materials. The direct effect of cement dust pollution was previously studied; they have demonstrated linkages between cement dust exposure, chronic impairment of lung function and respiratory symptoms in human population. Cement dust irritates the skin, the mucous membrane of the eyes and the respiratory system (Truong-Minh *et al.*, 2009). Occupational cement dust exposure has been associated with an increase risk of liver abnormalities, pulmonary disorders and carcinogenesis (Vijai and Deep 2008). Pimental and Menezes (1978) described diffuse swelling and proliferation of sinusoidal (hepatic) lining cells, sarcoid type granulomas and perisinusoidal and portal fibrosis in the liver of cement mill workers. These changes are closely related to inhale cement dust. In their opinion, the inhaled cement particles reach the liver by the blood stream and produce different types of hepatic leisons and they also found cement dust inclusion in the liver.

Liver diseases were among the first disorders to which serum enzymes tests were applied and have proved to be useful in diagnosing diseases of the liver (Ukoha 2005) in the majority of clinical laboratories. Measurement of the transaminase

(ALT and AST) and alkaline phosphate in response to clinical request for liver function tests are routinely used (Ukoha 2005).Some tests which are commonly done on a blood sample are LFT's (Liver Function Test), these usually includes Alanine Transaminase (ALT), Alkaline Phosphatase (ALP), Albumin, Total Protein, Bilirubin, other test include blood clotting test, Gamma-glutamyl transferase (GGT) and immunology. This study investigated the effect of cement dust on the values of liver and kidney function indices on Obajana cement factory workers.

2. MATERIALS AND METHODS

Materials:

The major equipments used are: Agilant Spectrophotometer, S800 Diode Array Spectrophotometer, Abascus Junior Haematology Analyser 2.75 (Diatro Count 3 Haematology EC Diatron, MJ PCC, Hungary).

Chemicals and Reagents:

All chemicals and reagents were of analytical grade.

Ethical clearance:

Ethical clearance was dully obtained from Department of Research and Development. Ministry of Health, Lokoja, Nigeria. Written and verbal informed consents were taken from all workers.

Blood sample:

Blood samples were collected from 60 factory workers each(randomly selected) (10 from crusher workers, 10 from kiln workers, 10 from milling workers, 10 from bagging, 10 from loading workers and 10 from non workers as control) by help of professionals through clinic and designated clinic.

Anthropometrical parameters/questionnaires:

Data collection were effected by way of an interview, administered structured questionnaire to determine years of exposure as deduced from date of employment, site or position at workplace, use of safety gadgets such as dust masks and earplugs etc. Information on general health, history of past disease(s) and habits such as smoking and alcohol consumption were obtained (Friday et al, 2016).

Distribution of study subjects according to physical characteristics used (Friday et al, 2016) for this report was as follows : height distribution (mean + SD) in units 1.61 – 1.63±0.05m, Body weight range between 63.86±7.67 - 66.26±6.02kg body weight, Age ranged between 22 – 55 years. Year in the work range 4.26±1.49 – 6.30±2.15 years and hour of exposure ranged between 8.0±0.00 to 10.00±2.11 hours daily of the workers were exposure to dust (Friday *et al* 2016, Friday, 2016).

ANALYSES:

Biochemical Assay:

Liver enzymes activities and kidney function analyses were carried out on serum of factory workers to determine the total protein, albumin, urea, creatinine, electrolytes such as sodium, potassium, bicarbonate and liver enzymes such as aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase using Randox diagnotistic and TECO and kits with methods described below.

Aspartate aminotransferase (AST):

The activity of Aspartate Aminotransferase was determined according to the method of Reitman and Frankel, (1957).

Alanine aminotransferase (ALT):

ALT was measured by the method of Reitman and Frankel (1957).

Alkaline phosphatase (ALP):

The activity of alkaline phosphatase was determined using p-nitrophenyl phosphate kinetic reaction, according to the method described by Wenger, *et al* (1984) .

Protein:

The serum total protein concentration was determined by Biuret colorimetric reaction, according to the method described by Koller (1984) and Burtis, *et al* (1999).

Creatinine:

Bartels and Bohmer (1972) method was used to determine creatinine.

Albumin:

The measurement of serum albumin was based on its quantitative binding to the indicator Bromocresolgreen(BCG). The albumin - BCG complex absorbs maximally at 578nm. The absorbance is directly proportional to the concentration of the albumin in the sample (Doumas, 1971).

Urea:

Fawcett and scott; 1960 method was be used. The urea in serum is hydrolyzed to ammonia in the presence of urease. The ammonia is then measured photometrically by Bortholot reaction.

Determination of sodium

Colorimetric method of Tietz, 1995 was used to analysed sodium in serum using TECO diagnostics kit.

The method was based on those described by Maruna, 1958 and Trinder, 1951 in which sodium is precipitated as the salt, sodium magnesium uranyl acetate, with the excess uranium then being reacted with ferrocyanide, producing a chromophere whose absorbance varies inversely as the concentration of sodium in the test specimen.

Determination of Potassium:

Colorimetric method of Tietz 1995 was used to determined potassium using TECO DIAGNOSTICS KITS Principle.

The method is based on modification of those first described by Maruna 1958 in which sodium is precipitated as the tripple salt, sodium, magnesium uranyl acetate with the excess uranium then being reacted with ferrocyanide producing chromophore whose absorbance varies inversely as the concentration of sodium in the test specimen.

Determination of Bicarbonate:

Carbonate was determined by method Tietz (1986) as in the TECO Diagnostic kits.

Statistical Analysis:

All data were analyzed by Analysis of variance (ANOVA)procedure while treatment means were separated by The level of significance at $p \leq 0.05$

3. RESULTS

Liver function test of exposed and unexposed workers to cement dust:

The results showed the value of Aspartate aminotransfarase (AST), Alanine aminotransfarase (ALT), Alkaline phosphatatse (ALP), Total protein (TP) and Albumin (AL) determined in blood serum obtained from workers of different five units and non workers (control) of Obajana Cement industry.

Table 1: Liver function enzyme activity in exposed and unexposed workers to cement dust in Obajana cement factory

	AST	ALT	ALP	TP	ALB
	(U/L)	(U/L)	(U/L)	(mg/dl)	(mg/dl)
Cw	26.32 ± 6.32	21.93 ± 6.69	38.66	53.56 ± 12.69*	30.77 ± 9.92
Kw	30.41 ± 6.78	21.26 ± 6.24	31.16 *	52.22 ± 11.73*	34.73 ± 7.05
Mw	27.68 ± 6.29	24.36 ± 8.11	34.68	37.69 ± 10.89	31.53 ± 13.84
Bw	30.12 ± 4.92	19.69 ± 5.85	44.83	35.66 ± 7.25	27.04 ± 5.57
Lw	30.32 ± 6.97	17.70 ± 5.59	42.12	35.51 ± 8.78	30.05 ± 9.71
Control	19.29 ± 4.77	16.31 ± 4.97	33.44	53.22 ± 8.75	36.16 ± 12.35

AST=Aspertate aminotransfarase, ALT=Alanine amino transfarase, ALP= Alkaline, ALB = Albumin

^{AST}LSD(0.05) =2.707, ^{ALT}LSD(0.05) =5.622, ^{ALP}LSD(0.05), =10.11 ^{PROTEIN}LSD(0.05) =9.066, ^{ALBUMIN}LSD(0.05) =9.028. where the mean difference is higher than LSD value then the subject is significantly difference from each other.The mean with superscript *in the same column are not significantly different from the control at P≤ 0.05

AST increased in the entire unit but ALT did not show any significant difference. ALP increased in Cw, Bw, and Lw

The result shows that the values of AST, ALT and ALP were higher in all the exposed workers (Cw, Kw, Mw, Bw, and Lw) than control. The result shows that total protein decreased in Mw, Bw, and Lw, Albumin did not show any significance difference.

In AST, value obtained from Kw unit was the highest (30.41±6.78 U/L), so also ALT in MW unit(24.36 U/l) and ALP value in mw unit(44.83 U/L). In general the result showed difference among the unit and with to the control.

The result further show that total protein decreased in Mw, Bw, and Lw, Albumin did not show any significant difference.Most of the values of TP and ALB obtained in the units were lower than the control except in Cw which has the higher values of TP value compared to control.

Kidney function test of exposed and unexposed workers to cement dust:

The result is presented in the table 5 below.

Table: 2 Effect of cement dust on blood electrolytes of factory workers

	Crea	Urea	Na^+ MEq/l	K^+ MEq/l	HCO_3^- MEq/l
Section/unit	**Mmol/l**	**Mmol/l**			
Cw	56.99 ± 17.25	40.04 ± 14.07	141.25 ± 23.37	16.11 ± 3.23*	35.64 ± 9.33
Kw	50.97 ± 9.58*	41.24 ± 16.15	129.42 ± 25.69	18.93 ± 6.83	39.46 ± 11.69
Mw	75.21 ± 22.99	35.52 ± 10.33	130.15 ± 27.65	12.62 ± 3.85	28.01 ± 8.90
Bw	85.17 ± 26.50	31.78 ± 8.90	158.31 ± 21.96	15.18 ± 4.67*	30.71 ± 7.13
Lw	74.56 ± 17.22	25.83 ± 7.72	145.94 ± 24.04	16.28 ± 3.43*	33.26 ± 3.46
Control	63.01 ± 22.93	21.22 ± 5.86	130.03 ± 15.28	12.85 ± 7.52	24.15 ± 5.32

Crea = Creatinine, Na^+ = sodium electrolyte, k^- = Potassium = Electrolyte, BCO_3^+ = Bicarbonate electrolyte

^{Na}LSD(0.05) =20.741, ^{K} LSD(0.05) =4.625, $^{Hco-}{}_3$LSD(0.05), =7.209, ^{CREA}LSD(0.05) =17.947, ^{UREA}LSD(0.05) =3.523 . (where the mean difference is higher than LSD value then the subject is significantly difference from each other). The mean with superscript *in the same column are not significantly different from the control at P≤ 0.05

The table showed electrolytes in workers exposed to cement dust. Sodium and potassium level were significantly higher in workers working in Cw, Bw and Lw while there was no significant difference(p≥ 0.05) in level of bicarbonate in workers in Mw and Bw likewise the results showed that urea level was higher in all workers in the units, however the difference in Lw, and control showed no significant difference(p≥ 0.05).Creatinine (crea) was significantly higher in Bw followed by Mw.Also it showed all kidney function indices are higher in exposed workers than the control except in some case. Creatinine (crea) was higher in Bw followed by Mw; urea value was higher in Cw, Kw, Mw in this order, while Bw, Cw, Lw have higher value of Na^+ as arranged, while Kw, Lw, Cw in K^+ and Kw in Bco_3 in worker in Kw unit was higher.

Effect of period of cement dust exposure:

The tables 3 and 4 showed the results of the effect of cement dust relation to year of exposure on liver function and kidney function activities.

Table 3: Liver enzyme activity on in workers exposed to cement dust in relation to period of exposure

Years	AST	ALT	ALP	TP	ALB
	(U/L)	(U/L)	(U/L)	(mg/dl)	(mg/dl)
`1 - 4	29.69 ± 4.87	21.09 ± 6.44	36.78 ± 12.78	46.95 ± 14.25	32.74 ± 8.99
`5 - 8	28.18 ± 7.10	21.41 ± 6.72	39.01 ± 12.64	40.72 ± 12.02	29.66 ± 10.28
`9 - 12	31.27 ± 7.66	16.57 ± 8.92	41.80 ± 16.13	36.00 ± 5.23	28.49 ± 6.51
Control (0)	19.29 ± 4.66	16.31 ± 4.97	33.44 ± 5.95	53.22 ± 8.75	36.16 ± 12.36

^{AST}LSD(0.05) =3.191, ^{ALT}LSD(0.05) =3.576, ^{ALP}LSD(0.05), =6.294 ^{protein}LSD (0.05) =5.697, ^{Albumin}LSD (0.05) =5.150, where the mean difference is higher than LSD value then the subject is significantly difference from each otherThe mean with superscript *in the same column are not significantly different from the control at P≤ 0.05

The value of AST was higher in workers exposed for period of 1 – 4 years, followed by 9 – 12 and 5 – 8 years, while in 5 – 8 years exposure have higher ALT value, followed by 1 – 4 and 9 – 12 years respectively. It was also observed that in ALP investigation workers exposed for 9 – 12 years have higher values as compared to 5 – 8 and 1 – 4 years. Total protein TP and ALB were significantly lower in workers exposed to cement dust for period 1 – 4, 5 – 8 and 9 – 12 as shown .

Table 4: Effect of cement dust on electrolytes of Obajana cement factory workers in relation to period of exposure

Years	Crea	Urea	Na^+	K^+	HCO_3^-
	Mmol/l	Mmol/l	MEq/l	MEq/l	MEq/l
`1 - 4	60.10 ± 2.99	31.74 ± 11.67	140.01 ± 28.81	15.66 ± 5.41	32.90 ± 10.03
`5 - 8	72.71 ± 21.56	38.55 ± 12.72	138.84 ± 24.97	15.74 ± 4.74	33.27 ± 8.80
`9 - 12	87.85 ± 29.76	22.87 ± 8.34	158.33 ± 6.58	17.61 ± 1.49	38.07 ± 6.20
Control (0)	63.01 ± 22.93	21.22 ± 5.86	130.03 ± 15.28	12.85 ± 7.52	24.15 ± 5.32

The mean with superscript *in the same column are not significantly different from the control at P≤ 0.05 ^{Na}LSD(0.05) =10.894, ^{K}LSD(0.05) =2.837 ^{bicarbonate}LSD(0.05) =4.300, ^{CREA}LSD(0.05) =12.123, ^{UREA}LSD(0.05) =0.896, (' (where the mean difference is higher than LSD value then the subject is significantly difference from each other).

The effects of cement dust on kidney function and electrolytes relation to period of exposure are shown on the table. The value of Na^+, K^+ and HCO^-_3 were higher in the 9 -12, followed by 5 – 8 and 1 – 4 years of exposure to cement dust.

Statistical analysis showed that workers exposed for 9 - 12 showed significant difference while others does not in creatinine concentration. While urea concentration was significantly higher in 5-8, 1-4 and 9-12 years in this order. Workers that worked for 9 year and above had highest value of creatinine, followed by workers that spent between 5 to 8 years, no significant different with workers that worked for 1 to 4 years and the control, however workers that spent 5-8 year had highest level of urea, followed by 1-4 and 9-12 years, LSD(0.05) showed significance difference.

Effect cement dust exposure on workers in relation to age:

Table 5: Effect of cement dust on liver enzymes in factory worker in relation to their age

Age	AST	ALT	ALP	TP	ALB
(Year)	(U/L)	(U/L)	(U/L)	(mg/dl)	(mg/dl)
22 - 35	27.61 ± 6.30	20.55 ± 7.03	37.24 ± 11.07	46.73 ± 12.32	32.46 ± 9.97
36 - 45	27.17 ± 8.31	18.40 ± 6.62	37.55 ± 14.64	38.60 ± 12.53	29.62 ± 9.86
46 - 55	25.20 ± 9.95	22.76 ± 10.29	40.12 ± 5.48	53.77 ± 12.75	34.53 ± 16.66

^{AST}LSD(0.05) =, ^{ALT}LSD(0.05), = ^{ALP}(LSD)= where the mean difference is higher than LSD value then the subject is significantly difference from each other.

The AST, ALT, and ALP values were significantly higher in workers of aged 46 – 55 years compared to that aged 22 – 35 and 36 – 45 years. TP, and ALB values were higher in workers aged 46 – 55 years as compared to that aged 22 – 35 and 36 – 45 years.

Table 6: Effect of cement dust on electrolyte of Obajana cement factory workers in relation to their age

Age	Crea	Urea	Na^+	K^+	HCO_3^-
(Year)	Mmol/l	Mmol/l	MEq/l	MEq/l	MEq/l
22 - 35	65.59 ± 24.92	30.84 ± 12.22	138.05 ± 27.28	15.16 ± 5.90	31.76 ± 9.05
36 – 45	72.41 ± 17.83	36.49 ± 12.45	144.68 ± 17.47	15.68 ± 4.84	31.65 ± 10.42
46 - 55	65.82 ± 17.86	32.29 ± 23.34	120.97 ± 20.70	15.39 ± 2.54	34.60 ± 5.43

NaLSD(0.05) =8.756, KLSD(0.05), = 2.392 Hco-3LSD(0.05), =3.377, CREALSD(0.05) =9.028, UREALSD(0.05) =0.909 (where the mean difference is higher than LSD value then the subject is significantly difference from each other)'

The result showed that workers have raised level of sodium ion in this order 36-45, 22-35 and 46-55 years old, the difference was significant in workers with age range 36 -45, 22-35 with 46-55. The result showed that for UREA, values was higher in workers aged 35 – 45 years followed by t 46 – 55 and 22 – 35 years old respectively.

The result 6, showed that for Crea, Urea, Na^+, K^+, HCO_3^- values were higher in sample for aged 35 – 45 years followed by these of 46 – 55 and 22 – 35 years respectively.

4. DISCUSSION

The factory workers with anthropometric data of age, weight, height of the same range were used for this study, also the period and hour of exposure to cement dust in all the units were in the same range(Emmanuel *et al* 2016., Friday, 2016) thus make our finding to be correlated. The average age of the workers and the control used were on the same range these were this same finding in report of Mojiminiyi, 2008.

In this work the summary of the results of liver and kidney functions indices determined in both exposed and unexposed workers to cement dust indicate elevation in AST, ALT, and ALP in exposed as compared to unexposed workers. The elevations in AST in exposed group are not significantly different (p>0.05). This result is in agreement with report of Ezeonu and Ezejiofor 1999. However, Mojiminiyi *et al,* 2008 reported lower level of AST and ALP in exposed group compared to control. In Total Protein (TP) and Albumin, there was no significant difference p>0.05 with the control except the workers in Bw and Lw which had slight decrease TP and workers in Lw lower ALB as compared. However, these parameters in all the group fall within the normal reference range (Pagana and Pagana 2005). Thus, this result suggest that cement dust likely affect liver but in contrast with the views of Mojiminiyi *et al*, 2008.

However, in another report by Gray and Howorth 1982, Rosalki, 1974 and Conny, 1967 have no different with view above, which reported that raised levels of transaminase (AST, ALT) have serious implications for cement workers, such elevation are found in cases of both liver damage and myocardial infarction (G & H). The elevation of AST alongside the ALT makes the liver a target of suspicion as this is the usual pattern in cases of hepatotoxicity cause by toxic agent (Mojiminiyi *et al*, 2008). Enzyme induction for detoxification and elimination of foreign compounds facilitating survival in a chemically hostile environment takes place in the liver and this could be responsible for the elevation of such liver enzymes as AST and ALT. however, this result does not mean that there is no effect of cement dust on liver function because Cornish, 1971 noted that most liver function tests are not particularly sensitive in pathological screening because as much as 20 – 50% of the functional capacity of the liver must be impaired before they show abnormality.

The roles of the liver include metabolism functions, expulsion and toxicity removal and storage. These functions normally evaluated by measurement of various enzymes. Serum AST, ALT are liberated into the serum after extensive tissues damage, heart muscle is rich in AST whereas liver is rich in both. The increased in levels of enzymes are thus indicators of myocardial ischemia and liver damage (Vestbo, *et al.*, 1991). While alteration in the ALP levels are associated with hepatobiliary and bone diseases (Maier, *et al.*, 1992). In this work, the significant raised AST, ALT and ALP levels probably suggest that workers working in Cw, Kw, Mw Bw and Lw sections are more susceptible to hepatic damage.

The reduction in plasma protein in workers exposed to environment pollutants, cement dust could attributed to changes in protein and free amino acid metabolism and their synthesis in the liver (Oluwayernis, 2012) or protein depression in the blood was also reported in to be mainly due to excessive loss through nephrosis or it may be due to reduced protein synthesis or increased proteolytic activity or degradation (Rana et al., 1996) or damaging effect of cement dust on liver cells as confirmed by the increase in the activities of plasma AST, ALT and ALP.

The result of the electrolytes conducted on the exposed and unexposed workers as indicated in the result showed that no significant difference p>0.05 in the value of exposed and unexposed worker in CREA, UREA, Na^+, K^+ and HCO_3^-. Although the values obtained in the exposed are higher than control.

Creatinine is a waste product in the blood created by the normal breakdown of muscle cells during activity. When kidneys are not working well creatinine builds up in blood. The result indicates elevation of creatinine in blood of workers in Cw, Mw, Bw and Lw as compared to control unexposed. Slight elevation of creatinine level above normal range is an indication that the kidneys are not working at full strength which may be as a result of toxicants or disease.

Blood carries protein to cells throughout the body after the cells used the protein the remaining waste product is returned to the blood as urea. Healthy kidneys take urea out of blood but kidneys that are not working well, the urea stay in the blood; thus our result indicate elevation of urea in exposed workers which may be as a result of kidneys inability to remove them from the blood.

Our report revealed increase in levels of HCO_3^- in the entire exposed group as compared to the control. The elevation is significantly different $p<0.05$ to the unexposed workers. The position of our report corroborate with the report of Ezeonu and Ezejiofor (1999) and Gray and Howorth 1980. This may be due to view of Theodore, 1980 and Akahara, (1994) that the presence of high content of oxides of alkali and other metals namely: Calcium oxide 62 – 66%, Silicon Oxide 19 – 22% Aluminum trioxide 4 – 8% Ferric Oxide 2 – 5% and Magnesium 1 – 2% in cement.

The value of Na^+ and K^+ in the exposed and unexposed show no significance difference $p<0.03$ indicating that the Na^+ and K^+ are still within range of the control. Thus cement dust have not affected the unbalance of ions levels in the body. It was also noted that the values of the Creatinine, Urea, Na^+, K^+ and HCO_3^- are still with the normal range report by Ezeonu and Ezejiofor (1999). However, the slight elevation of electrolyte may be explain due to relative hemo concentration in the exposed group due to mild dehydration and stress (David *et al* 2002).

The health risks posed by inhaled dust particles influenced by the duration of exposure and biological responses exerted by the particle (Meo, 2004). Studies are available on lung, liver function test and cement dust but most of these studies were conducted without considering the long term duration - response effect between years of exposure and respiratory/liver/kidney impairment (Fell et al., 2003).

In another development there was significance increased in Aspartate transaminase and alkaline phosphatase activities and decrease in total protein and albumin levels with increased in year of exposure to the cement dust. However, the activity of alanine transaminase was significancely reduced in 9 years and above of exposure and no significant increased noticeable in years 1 - 8 as compared.

According to these result age of worker does not affect the activity of aspartate aminotransfarase, alkaline phosphatase but the level of alanine transaminase, total protein and albumin were significantly higher in worker with aged ranged 46 - 55 years.

The difference in the level of creatinine, sodium ion, potassium ion and bicarbonate ion were not significantly increase with age of the workers except in urea in which the workers with age range 36 - 45 years had significant higher value of urea compared to below 35 years and 46 years and above.

5. CONCLUSION

This study adds to evidence that cement dust adversely affect the hepatic and kidney function, and also the impairment is associated with duration of exposure to cement dust.

The findings are of importance in that it highlights the need to overcome the effects of long-term exposure. It also exhibits the magnitude of the effect in each unit where workers work.

Thus alteration in the hepatic and renal function, in exposed workers is an implication of effect of cement dust on human health.

The hepatotoxic and renaltoxic effects of cement dust and possibilities of developing autoimmune diseases might exacerbated if the exposure to this is not controlled. Therefore, it is advisable that the cement factory management, their workers, and health officials even Government should work together to adopt technical preventive measures such as a well-ventilated work areas, workers should wear appropriate apron, mask, safety goggles, gloves, ear plugs, provide period medical surveillance test and Heath education should be given regarding the personal protection measures, but needs reinforcement in form of regular education programs and legislative (friday, 2016).

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