

WELDING FUMES AND HEALTH HAZARDS: RAISED LEVELS OF TRACE ELEMENTS IN THE BLOOD SERA OF WELDERS

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Abstract

Welding fumes cause hazardous changes in the blood chemistry of welders.

The concentrations of elements viz. Zinc. Copper. Cadmium and Iron elevate to the level of toxic range in the serum. Reduced but insignificant levels of formed elements are also observed. All changes jointly cause nausea, diarrhea and constant elevated temperature besides the general weakness among the welders.

Introduction

Environmental pollution is becoming the common problem of most of the countries and Pakistan is one of them. The world wide attention is focussed to all the problems developed due to industrial and other pollution. The welding industry in Pakistan is almost spreaded on the main roads and streets of the cities and villages & also on highways. This increases the risk of the toxicity due to presence of generated fumes in the environments. Welding is a common profession of technical trade of an easy access to poor common man. It is most important and useful industry in modern technology and is being considered technical field which mostly feeds the poor families. Through inhaling of toxic fumes, worker develops health complications due to disbalances in normal trace element levels. Moreover this becomes more difficult when performed in tropical region, like Hyderabad, Sindh Pakistan. The problem is further aggravated when no preventive measures are taken i.e. to put gloves, masks & glasses etc. Specific symptomatic and clinical findings viz. lungs, GIT, Liver, Kidney etc. have been reported in this population Hewitt et al., (1978) (Charr, 1956; Stanescu et al., 1967; Spleiska, 1970) (Hicks et al., 1984) viz: fibrosis lung damage (Langaard, 1980) Hicks et al., 1984) and kidney dysfunction (Kazantis, 1975); etc.

In order to identify clinical finding health survey of welders in Hyderabad, Kotri, Jamshoro, T.M. Khan and Hala has been carried out covering different and related parameters such as dietary, physiological and social circumstances etc.

Methodology

One hundred workers engaged in gas and electric welding profession aged 16-50 years selected for the present study. Among them only 3 had primary education, 16 had just completed their high school and the rest were uneducated. The survey was carried out in the variety of locations in the city of Hyderabad and villages & colonies to its adjoining areas Latifabad, Kotri, Jamshoro and Hala road.

The questionnaire was prepared with the consultation of physician dealing such cases and was provided to all the subjects and in case of uneducated workers the questions were asked by researchers regarding general health, symptoms of internal & external health complications, life style, medical, social and occupational histories.

Results

The answers given by the workers were studied thoroughly with special attention to their dietary habits and drug abuse also. The statistics obtained is summarized in fig. 1. The subjects were divided into smokers, nonsmokers and addicts and non-addicts. It is found that among them more than half i.e. 60% of the welders were using different narcotics and 40% were classified to non narcotic but occasionally were in use of common drugs to overcome the tiredness & minor pain because of continuous work. They use general analgesics on their own as (i.e. self medication). Data given in the fig. 1. shows % of medicine being used.

As the welders face different health problems are grouped on the basis of diseases in the following.

Table-1

Average percentage of diseases in welders

<u>System/organ involved</u>	<u>%</u>	<u>Complications/incidence</u>
Gastro Intestinal tract	38.5	Digestive discomfort, ulceration, constipation.
Respiratory	18.0	Asthma, Nasal Atrophy, Emphysema, Cough, Chronic Bronchitis.
Renal	13.0	Nephrotic syndrome, Edema, Albuminuria, Proteinuria, Renal failure.

Hepatic	08.0	Liver cirrhosis.
Cardiac	05.5	Chest pain
Ophthalmic	05.0	Myopia, Blurred vision, Night blindness.
Skin	06.0	Allergic rashes.
Muscular	06.0	General weakness.

Survey also confirms that the worker are habitual to use drugs without consulting any doctor during and after work as they are not financially sound to pay doctors fee & do not afford to waste working hours.

Different elemental levels of Serum concentrations viz. Copper, Cadmium, Iron and Zinc were also estimated in the samples obtained from welders and non-welders (controls) to identify and assess the toxicity in the workers as there is direct correlation. The data in fig 4 & 5 shows that the average worker is at risk. The level of these metals are significantly higher in the welder exposed to welding fumes than the normal. Following elements cause particularly and specific health complications in general population. This is an arbitrary selection but all of them increasing quantitatively important environmental risk. As it reflects is the amount of information that is available.

1. *Iron:-* Ferrous oxide, less harmful, however optimum excess causes benign pneumoconiosis, a disease due to excess deposition of particles and ultimately leads to lung fibrosis. (fig. 4).
2. *Copper:-* When increased causes damage to all organs. Liver fibrosis which is diagnosed by ring in eye. Increase in brain causes Nigra.
3. *Zinc:-* Necessary for enzymes, DNA, hormones, amino acids, uterus tonicity, thus increases fertility. Generally it is non toxic but becomes toxic when it combines with lead (ghee, diesel exhaust, pipelines), cadmium, antimony. (fig. 4).
4. *Cadmium:-* Naturally occurring substance. Every one is exposed to cadmium in food water and air. Tobacco smokers are highly exposed thus welders are at greater risk. It causes functional disbalance at Proximal tubule (kidney dysfunction). Uremia, proteinurea, glycosuria. It becomes more dangerous when causes excretion of Calcium, Phosphate & Creatinine which develops osteoporosity i.e. inhibition of bone repair. Common in Japan generally

called Ittai (Ouch-Ouch) disease. Liver damage is also reported. Testicular necrosis has also been observed. (fig. 5).

The above affects were observed and reported by physician among the subjects who visited on our advise i.e. after complete exposure.

Discussion

Pakistan is a developing country, with poor and below the world standard socio-economic conditions, where welding profession is one of the common source of income being used to support their large families.

The survey conducted in the city of Hyderabad and its adjoining areas, has provided the clear picture about occurrence of the health problems among welders who never took appropriate care of their health but to keep busy to earn their livings. It is needless to say that the poor economical position also compels the workers to go for self medication as presently in our country it is not only costly but also time consuming, which worker consider wastage of time because they temporary get euphoric relief, thus take medicines without consulting the doctors (fig. 2).

On the other hand Psycho-physiological stress also attract them to use the narcotics and othe local Indian durgs like chars, manpuri, Naswar, Heroin etc. to over come the tiredness which helps them to work for longer period.

In developing countries many investigators (New house and Murray, 1979) have provided contradictory reports regarding the incidence and serverity of harmful effects of inhaled welding fumes as they are attended immediately. It seems likely that even in such workers highest exposure plays a substantial role to develop the complains (Obraek et al., 1985).

A high incidence of GIT and respiratory disturbances has further strengthen our findings and in consistent to Doig et al., (1951), Stanescu et al., (1967), Al Shamma et al., (1979). Subjects who are in frequent use of analgesics generally develop ulceration and constipation.

The respiratory complications attributed to the affects of inhaled mixture of irritant gases produce complication in lung and also in the animals (Freeman et al., 1968) and similar effect have also be observed in the welders of their area however it also depends on the resistance & efficiency of alveolar clearance mechanism (Hicks et al., 1984). Heavy and long pre exposure of the workers to the fumes might be responsible for continuous accumulation and less excretion of such toxic material which in turn to produce respiratory complications like asthma, cough and

tracheal pain, observed in our subjects. These reports are in consistent to our findings (Table/Fig. 3).

Accumulation of welding fumes in the other susceptible organs like liver, kidneys, heart, brain, testis and pancreas have also been reported by Hewitt et al., (1978); Al shamma et al., (1979), seems to be the reason for the respective organ disorders in the welders studied. In present study renal problems are on higher side which is aggravated due to use of the unfiltered water and less output of urine due to perspiration.

About 6% of these workers working with the electrodes are suffering from skin rashes and ophthalmic problems exposed to continuous strong sparks of high intensity. Though there were no complaints of eye sight but needless to say that the cornea & eye balls possessed pigmentation which was also due to strong flashes of the arc. Deposition of certain metallic compounds in the tissues has also been reported.

Conclusion

1. Welding toxic fumes affects on workers health. Unhygienic and polluted environments further enhance the problem. The Gastro intestinal tract is most affected system.

2. Respiratory organs are attacked with direct inhalation in comparison to any other system.

3. Smoking, self medication and addiction undoubtedly aggravates the health risks as they are leaning factors for diseases.

4. The percentage of affected worker could be reduced if proper precautions are taken and doctors advice is followed properly.

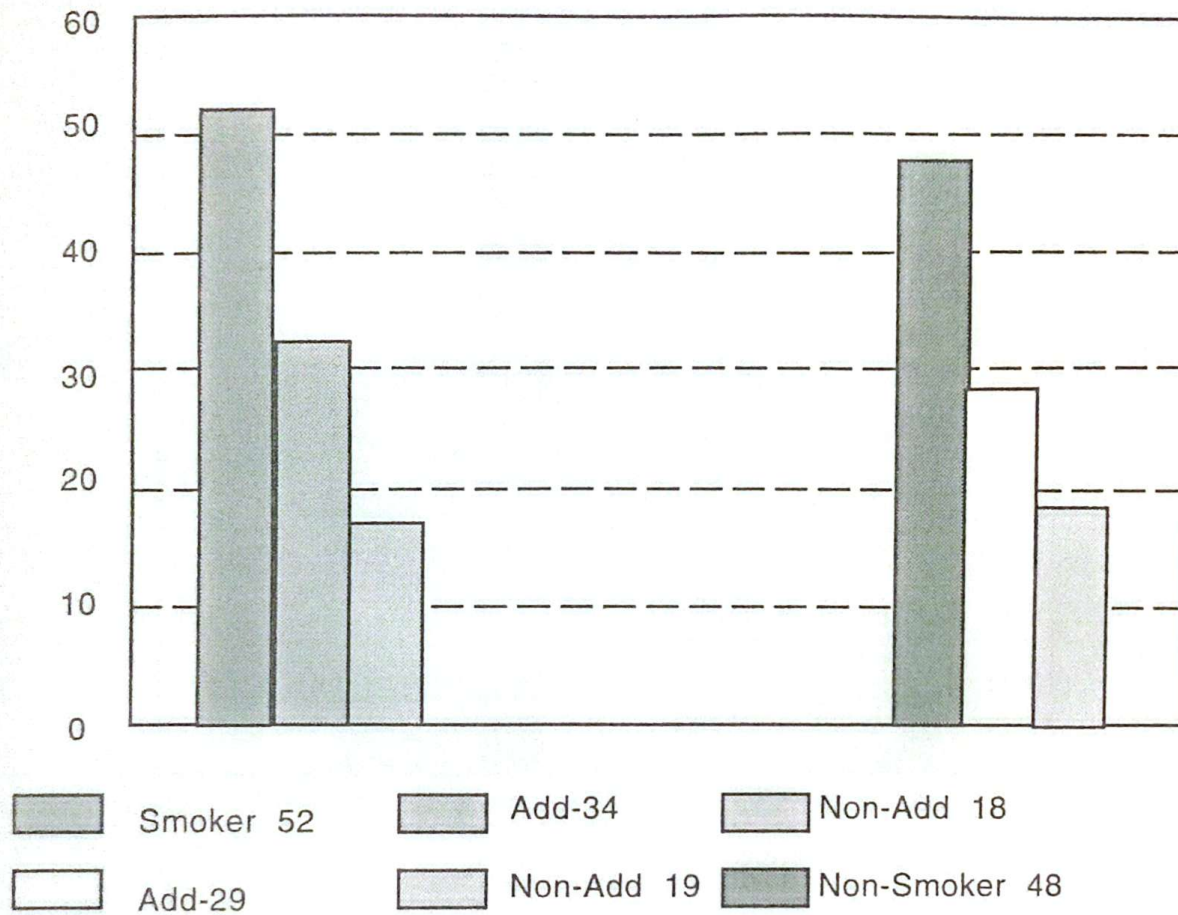
5. Over all many environmental pollution risks could be reduced to the minimum or negligible level if this industry is properly handled and looked after by training the workers for precautions regularly who are poor and uneducated.

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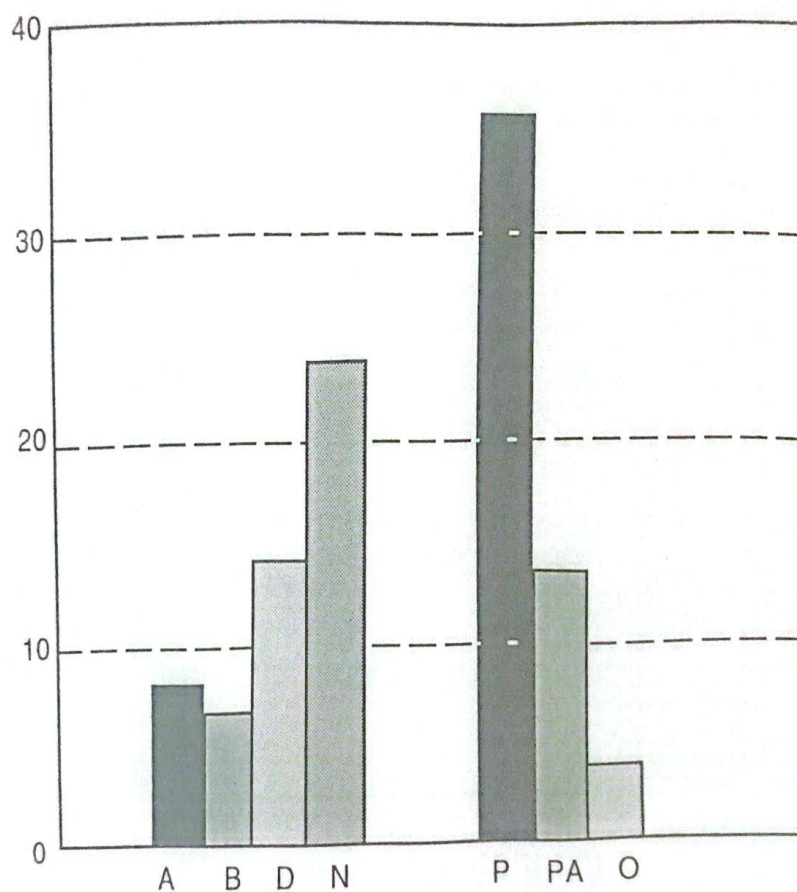
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Fig. 1. Percentage of addiction in smokers and non smoker welders.



P < 0.001

Fig. 2. Pain Killers commonly used by welders (self medication)



A=Asprin 7.4
B=Buscopan 6.4.
D=Disprin 13
N=Novelgen 23.
P=Paracetamol 36.
PA= Parapryrin 12.2 Others 3.

Fig. 3. Average % of diseases in the welders.

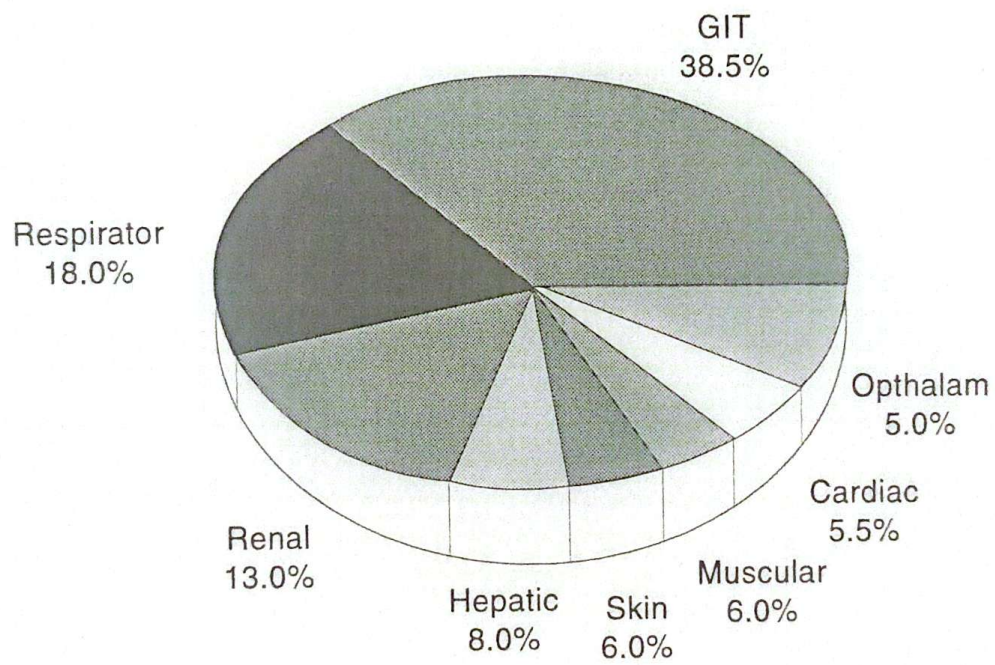
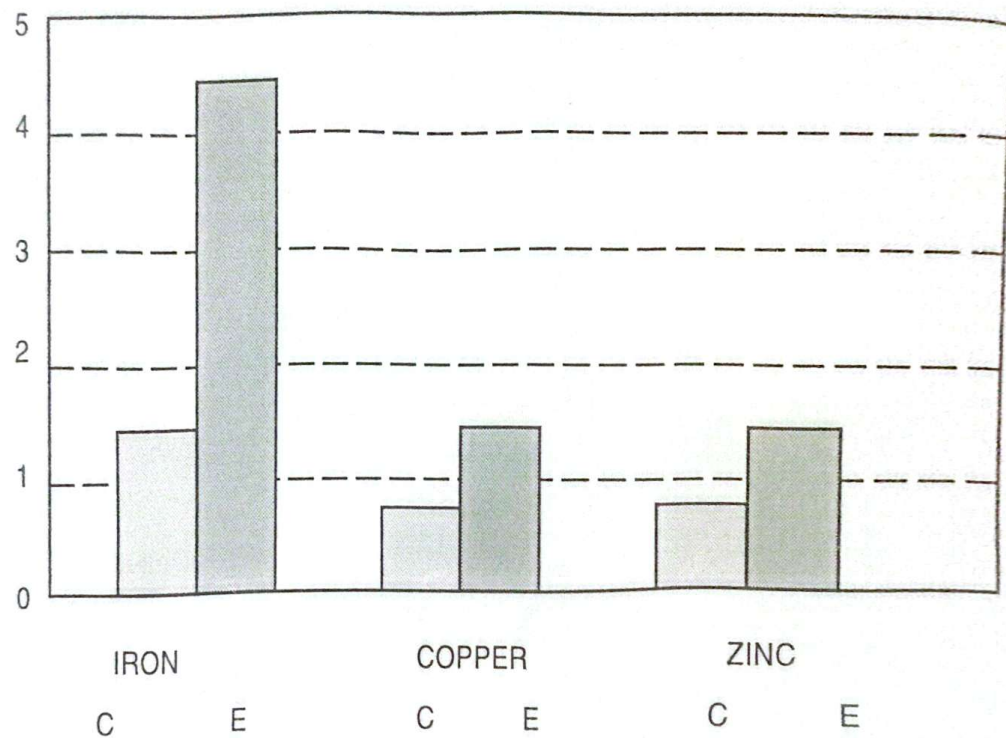


Fig. 4. Percentage of Fe, Cu, Zn (ppm) in the blood serum of welders & controls



C=CONTROL.

E=EXPOSED.

Iron	C=	1.695	Copper	C=	0.833	Zinc	C=	0.976
	E=	4.502		E=	1.363		E=	1.510
P=	<	0.001	P=	<	0.001	P=	<	0.001

Fig. 5. Percentage of cadmium (ppm) in the blood serum of welders and controls.

