

## **EFFECTS OF THE USE OF MEDIUM DENSITY FIBREBOARD ON FURNITURE CRAFTSMEN IN KATSINA, KATSINA STATE**

**Haruna Abdulkadir**

Department of Technical Education  
Hassan Usman Katsina Polytechnic, Katsina State  
haruna.abdulkadir@hukpoly.edu.ng

### **ABSTRACT**

*The study was designed to determine the effects of the use of Medium Density Fibreboard (MDF) on furniture craftsmen in Katsina, Katsina state. It is aimed at finding out the level of awareness of furniture craftsmen on the dangers posed by using MDF and the safe practices to be employed in preventing its effects. The targeted participants for the study were 40 participants consisting of 10 Environmental Health workers and 30 furniture craftsmen who were randomly selected using stratified sampling within the Katsina metropolis. Structured questionnaires containing 31 items were used for the study. Mean, Standard Deviation and t-test were used to analyse the data collected for the study. The null hypotheses were tested at a 0.05 level of significance. The findings among others revealed that the furniture craftsmen are aware that allergic rhinitis, chronic Bronchitis, skin irritation and itching, hypersensitivity pneumonitis, nasal and Sinus cancer due to prolonged exposure and even impairment of lung function can be caused by Formaldehyde and dust emission as a result of using Medium Density Fibreboard processing for furniture making. It was discovered that the effects can be reduced if the furniture craftsmen can adhere strictly to the safe practices in their activities with Medium Density Fibreboard. Based on the findings, it was recommended among others that Environmental Health workers in the Health Departments of all the local governments in the state should make sure that all furniture factories in operation adhere strictly to the safe practices outlined for woodworking.*

**Keywords:** Medium Density Fibreboard, Awareness, Formaldehyde, Dust.

### **INTRODUCTION**

Wooden furniture adds warmth and character to any room, whether it is for use in a modern or rustic home or office. When wood furniture is combined with steel or glass furniture, the inherent beauty of the wood adds an extra layer of luxury to the living space. Wooden furniture is incredibly durable and requires little upkeep. Whether it's spilled in the kitchen or scratched in the dining room, wood is a long-lasting natural material that can withstand continual abuse. Solid wood and other composite materials used for furniture, such as Plywood, Oriented strand board (OSB), and Medium Density Fibreboard, may last for generations with minimal care and are almost maintenance-free. Because of its outstanding surface and moulding qualities, medium-density fibreboard (MDF) is widely utilised in the furniture and cabinet industries. In layman's terms, it is wood panels made primarily of softwood and hardwood fibres. When utilised properly, MDF is robust and stable, and it is devoid of wood grain and knots. These characteristics make it ideal for residential buildings and home furnishings, where accurate machining, complex patterns, and smooth finishes are required (Silhavy, 2020). Exposure to formaldehyde gas, which is released by MDF, is the most serious hazard when utilising it. Urea-Formaldehyde (UF) is a solid chemical formed from a combination of Urea and Formaldehyde that is commonly used in MDF glue. It's a group of synthetic resins formed from a chemical reaction between urea (a solid crystal made from ammonia) and formaldehyde (a highly reactive gas made from methane), and it's mostly used as an adhesive for glueing plywood, particleboard, and other man-made wood products (Britannica, 2021). More formaldehyde can be added to the Urea to create a stronger bond. The more formaldehyde there is, the more it will be held in the wood and eventually discharged into the environment. (Centre for Occupational and Environment Medicine, 2010).

The dust formed during the manufacturing of MDF furniture is a secondary health risk. Wood dust is divided into two kinds by Yuan et al., (2014): cutting and sanding dust particles. MDF dust, like any other dust, can irritate the nose and eyes. Sawing, sanding, and drilling are just a few of the processing processes that create massive dust clouds. The most frequent route for dust to enter the human body is inhalation. When the respiratory systems for cleaning and protecting themselves are overworked, excessive dust inhalation occurs. For all types of wood dust, the Workplace Exposure Limits (WELs) are specified in milligrams (mg) of material per cubic metre of air (m<sup>3</sup>). Hardwood dust has a WEL of 3mg/m<sup>3</sup> (based on an 8-hour time-weighted average), while softwood



dust has a WEL of  $5\text{mg}/\text{m}^3$  (based on an 8-hour time-weighted average). The WELs for hardwood dust of  $3\text{mg}/\text{m}^3$  apply to all wood particles of dust present in a combination of hardwood and softwood dust (Thetkathuek et al., 2016). The size distribution and airborne concentration of MDF dust are dependent on the type of machinery, work, accessories, tools, and water content in the material used by today's furniture craftsmen.

An artisan is someone skilled in a particular trade. Furniture craftsmen are skilled in the creation of both public and private furniture (Cambridge Dictionary, 2021). Craftsmen design and build individual pieces of furniture and storage units such as chairs, tables, dressers, and closets.

According to Mustapha, (2021), the Chairman of the Katsina Interior and Furniture Expo 2021 decried the fact that Katsina has multiple enterprises making furniture out of Medium Density Fibreboard and other forms of wood worth over N 4 billion yearly on various sorts of furniture in the state. Cabinet manufacturers in the furniture industry are among the workers who are most likely to be exposed to MDF dust and formaldehyde emissions. The woodworking industry generates a high number of Nano and microparticles, which, depending on their size and substance, may pose health dangers to humans (Pavlovska et al., 2016).

We have become overly reliant on formaldehyde-contained fibreboard, which has resulted in a slew of health issues and environmental concerns that threaten our ecosystem. This necessitates an improvement in the degree of knowledge among furniture craftsmen to avoid future impacts caused by the chemical contents. Under the Control of Substances Hazardous to Health Regulations 2002, wood industry management is responsible for reducing health hazards posed by work activities (Health and Safety: COSHH - North West Leicestershire District Council, 2002). As a result, wood industry management must guarantee that dust and formaldehyde emissions are maintained as low as possible within the Workplace Exposure Limits (WELs). WELs are the mean concentrations of hazardous materials in the air during a given period also known as the Time Weighted Average (TWA).

The concentrations of contaminants in the city centre are astronomically high, posing a serious threat to human health. As a result, concerted efforts are required to raise awareness among Furniture craftsmen and the general public about the negative impact of Formaldehyde and dust emissions from MDF on the environment.

The main purpose of this study is to determine the furniture craftsmen's level of awareness of the effects of Formaldehyde and dust emission from Medium Density Fibreboard and the safe practices that should be employed to prevent the effects among Furniture craftsmen in Katsina, Katsina State.

## **RESEARCH QUESTIONS**

What is the level of awareness of the effects of Formaldehyde and dust emission from Medium Density Fibreboard among Furniture craftsmen and the safe practices employed to prevent the effects of the emission in Katsina state?

## **RESEARCH HYPOTHESES**

Two null hypotheses of no significant difference were formulated for the study between the mean responses of Furniture craftsmen and Environmental Health Workers on the effects of Formaldehyde and dust emission from MDF and the safe practices to be employed in preventing the effects and tested at a 0.05 level of significance.

## **MATERIALS AND METHOD**

The research design adopted for this study was a descriptive survey research design. A descriptive survey employs the use of questionnaires, interviews and direct observation to ascertain the opinions, attitudes, perceptions and preferences of individuals under study (Anyakoha, 2009). This study was carried out in the Katsina metropolis of Katsina State. The targeted population for the study consists of 40 participants comprising 30 Furniture craftsmen and 10 Environmental Health Workers who were randomly selected using a stratified sampling method. Structured questionnaires containing 31 items were used to collect the needed data from the participants. The questionnaire items were structured using a five-point rating scale with response options of Very Highly Aware (VHA) – 5, Highly Aware (HA) – 4, Moderately Aware (MA) – 3, Not Aware (NA) – 2, Highly Not Aware (HNA) – 1 and Strongly Agree (SA) – 5, Agree (A) – 4, Undecided (UD) – 3, Disagree (D) – 2, Strongly Disagree (SD) – 1 for the research questions. The questionnaire was validated by a Medical Doctor from Hassan Usman Katsina Polytechnic Clinic and a lecturer from the Industrial and Technology Education Department, Federal University of Technology, Minna. It was trial tested in Katsina using a population of 5 health professionals and 10 Furniture craftsmen. The data was analysed using Mean and Standard Deviation. The two null hypotheses were tested at a 0.05 level of significance.

## RESULTS AND DISCUSSION

**Table 1: Participants' mean responses on their level of awareness of the effects of formaldehyde and dust emission from medium density fiberboard**

S/No	Items	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_A$	Remarks
1	Inhaled wood dust causes allergic rhinitis	4.07	4.30	<b>4.19</b>	<b>Aware</b>
2	Inhaling MDF dust can cause chronic bronchitis	4.13	4.40	<b>4.27</b>	<b>Aware</b>
3	Occupational Asthma can be a result of MDF dust	4.13	4.30	<b>4.22</b>	<b>Aware</b>
4	Inhaling MDF dust can cause impairment of lung function	4.03	4.20	<b>4.12</b>	<b>Aware</b>
5	MDF dust causes skin irritation and itching	4.00	4.30	<b>4.15</b>	<b>Aware</b>
6	Excessive inhalation of MDF dust can cause various health effects	4.07	4.20	<b>4.14</b>	<b>Aware</b>
7	Dermatitis can occur as a result of chemicals from woods	4.10	4.10	<b>4.10</b>	<b>Aware</b>
8	MDF dust can cause allergic reactions	4.00	4.00	<b>4.00</b>	<b>Aware</b>
9	Prolonged MDF dust exposure can cause Hypersensitivity pneumonitis	4.10	4.20	<b>4.15</b>	<b>Aware</b>
10	Hypersensitivity pneumonitis begins with headache, chills, sweating, nausea and breathlessness	4.07	4.30	<b>4.19</b>	<b>Aware</b>
11	Prolonged exposure to formaldehyde can result in nasal cancer	4.07	4.10	<b>4.09</b>	<b>Aware</b>
12	Prolonged exposure to formaldehyde can result in sinus cancer	3.97	4.20	<b>4.09</b>	<b>Aware</b>
13	Prolonged exposure to formaldehyde can result in leukaemia	3.97	3.80	<b>3.89</b>	<b>Aware</b>
14	Formaldehyde emission causes conjunctival irritation	4.17	3.90	<b>4.04</b>	<b>Aware</b>
15	Formaldehyde causes cancer	4.20	4.00	<b>4.10</b>	<b>Aware</b>
16	Repeated exposure to formaldehyde may cause bronchitis on the skin and asthma-like allergy	4.23	4.00	<b>4.12</b>	<b>Aware</b>
17	Some people are not sensitive to formaldehyde	4.30	4.10	<b>4.20</b>	<b>Aware</b>
18	Watery eyes; burning sensations in the eyes, nose, and throat; coughing; wheezing; nausea; and skin irritation are short-term effects of formaldehyde	4.10	4.10	<b>4.10</b>	<b>Aware</b>
19	Formaldehyde gas contained in MDF dust can affect the general public	4.30	4.20	<b>4.25</b>	<b>Aware</b>
20	Formaldehyde can cause dryness of the nose and throat	4.17	4.10	<b>4.14</b>	<b>Aware</b>
GRAND TOTAL		4.11	4.14		

**Key:**  $\bar{X}_1$  = Mean of Furniture craftsmen,  $\bar{X}_2$  = Mean of Environmental Health Workers,  
 $\bar{X}_A$  = Average Mean

The result presented in Table 1 showed that the participants are aware that all the 20 items presented are effects of Medium Density Fibreboard.

The findings in Table 1 revealed that allergic rhinitis, chronic Bronchitis, skin irritation and itching, Hypersensitivity pneumonitis, Nasal and Sinus cancer due to prolonged exposure and even impairment of lung function can be caused by Formaldehyde and dust emission as a result of using Medium Density Fibreboard for furniture making. A study by Chung *et al.* (2000) revealed that more than 400 mg m<sup>-3</sup> was measured during sawing of Medium Density Fibreboard, he also added that MDF produces more dust in sanding than natural wood. Also, a study by Thetkathuek *et al.* (2016) revealed that the majority of employees in furniture factories had experience with atopic allergic asthma and allergic rhinitis.

**Table 2:**  
**Participants' mean responses on safe practises to be used in preventing the effects of formaldehyde and dust emission from medium density fiberboard.**

S/No.	Items	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_A$	Remarks
1	Safety goggles should be used while working with MDF	4.50	4.10	<b>4.30</b>	<b>Agree</b>
2	Hand gloves and an Apron should be used while working with MDF	4.50	4.30	<b>4.40</b>	<b>Agree</b>
3	MDF should be processed for furniture where there is adequate ventilation	4.20	4.60	<b>4.40</b>	<b>Agree</b>
4	MDF should be used where there is low humidity and moisture that will retard the breaking down of the formaldehyde into gas	4.30	4.60	<b>4.45</b>	<b>Agree</b>
5	Keep dust levels down with good housekeeping	4.20	4.50	<b>4.35</b>	<b>Agree</b>
6	Use a respirator with cartridges approved for dust and formaldehyde	4.23	4.60	<b>4.42</b>	<b>Agree</b>
7	Good hygiene includes washing whenever you get dirty and showering and laundering clothes at the end of the day	4.27	4.70	<b>4.49</b>	<b>Agree</b>
8	Employers should conduct air monitoring or have documentation that shows exposure limits	4.23	4.60	<b>4.42</b>	<b>Agree</b>
9	Workers' average daily exposure must be below 0.75 ppm	4.23	4.60	<b>4.42</b>	<b>Agree</b>
10	If workers' peak daily exposure is greater than 0.1 ppm, then the employer must enforce labelling, education and Material Safety Data Sheet (MSDS) requirements	4.30	4.70	<b>4.50</b>	<b>Agree</b>
11	MDF furniture should be kept water-free	4.37	4.70	<b>4.54</b>	<b>Agree</b>
GRAND TOTAL		4.30	4.55		

The result presented in Table 2 showed that the participants agreed that safe practices should be employed to prevent the effects of Formaldehyde and dust emission from Medium Density Fibreboard among Furniture craftsmen in Katsina, Katsina State.

The findings in Table 2 revealed that the furniture craftsmen in Katsina believed that all hope is not lost if the management of the furniture factories could adhere strictly to safe practices in their respective firms and keep sensitising their employees on the adverse effects of Medium Density Fibreboard to human health. According to Health and Safety Executive, employers have duties under the Control of Substances Hazardous to Health Regulations 2002 to control risks to employees' health arising from work activities (Health and Safety: COSHH - North West Leicestershire District Council, 2002). This means they need to ensure exposures to wood dust and formaldehyde emission are kept as far below the Workplace Exposure Limits (WELs) as reasonably practicable.

**Table 3: T-test of the participants on level of awareness of the effects of Formaldehyde and dust emission from Medium Density Fibreboard.**

S/No.	Items	SD <sub>1</sub>	SD <sub>2</sub>	p	Remarks
1	Inhaled wood dust causes allergic rhinitis	0.74	0.82	0.41	NS
2	Inhaling MDF dust can cause chronic bronchitis	0.78	0.70	0.34	NS
3	Occupational Asthma can be a result of MDF dust	0.73	0.68	0.53	NS
4	Inhaling MDF dust can cause impairment of lung function	0.72	0.63	0.52	NS
5	MDF dust causes skin irritation and itching	0.64	0.48	0.19	NS
6	Excessive inhalation of MDF dust can cause various health effects	0.74	0.63	0.61	NS
7	Dermatitis can occur as a result of chemicals from woods	0.66	0.57	1.00	NS
8	MDF dust can cause allergic reactions	0.70	0.67	1.00	NS
9	Prolonged MDF dust exposure can cause Hypersensitivity pneumonitis	0.71	0.63	0.70	NS
10	Hypersensitivity pneumonitis begins with headache, chills, sweating, nausea and breathlessness	0.58	0.68	0.30	NS

11	Prolonged exposure to formaldehyde can result in nasal cancer	0.69	0.74	0.90	NS
12	Prolonged exposure to formaldehyde can result in sinus cancer	0.67	0.79	0.37	NS
13	Prolonged exposure to formaldehyde can result in leukaemia	0.85	0.42	0.56	NS
14	Formaldehyde emission causes conjunctival irritation	0.65	0.57	0.25	NS
15	Formaldehyde causes cancer	0.55	0.47	0.31	NS
16	Repeated exposure to formaldehyde may cause bronchitis on the skin and asthma-like allergy	0.50	0.67	0.25	NS
17	Some people are not sensitive to formaldehyde	0.47	0.74	0.32	NS
18	Watery eyes; burning sensations in the eyes, nose, and throat; coughing; wheezing; nausea; and skin irritation are short-term effects of formaldehyde	0.80	0.57	1.00	NS
19	Formaldehyde gas contained in MDF dust can affect the general public	0.60	0.63	0.65	NS
20	Formaldehyde can cause dryness of the nose and throat	0.65	0.74	0.79	NS

Key:  $SD_1$  = Standard Deviation of Furniture craftsmen,  $SD_2$  = Standard Deviation of Environmental Health Workers,  $p$  = probability value, NS = Not significant and S = Significant

The result in Table 3 shows that there is no significant difference in the mean response of both groups of participants for all the items, therefore, the null hypotheses for these items were upheld because they are all above 0.05.

A t-test significance was used to test hypothesis 1 on the level of awareness of the effects of Formaldehyde and dust emission from Medium Density Fibreboard among Furniture craftsmen. Table 3 had all the items with a calculated sig. a 2-tailed value greater than 0.05, therefore, the null hypothesis of no significant difference was held for the items. Close examination of the means of furniture craftsmen reveals that they are close to those of Environmental Health workers.

**Table 4: T-test of the participants on the safe practices to be employed in preventing the effects of Formaldehyde and dust emission from Medium Density Fibreboard.**

S/No.	Items	$SD_1$	$SD_2$	$p$	Remarks
1	Safety goggles should be used while working with MDF	0.57	0.74	0.08	NS
2	Hand gloves and an Apron should be used while working with MDF	0.57	0.68	0.37	NS
3	MDF should be processed for furniture where there is adequate ventilation	0.55	0.16	0.05	S
4	MDF should be used where there is low humidity and moisture that will retard the breaking down of the formaldehyde into gas	0.54	0.52	0.13	NS
5	Keep dust levels down with good housekeeping	0.55	0.53	0.14	NS
6	Use a respirator with cartridges approved for dust and formaldehyde	0.68	0.52	0.13	NS
7	Good hygiene includes washing whenever you get dirty and showering and laundering clothes at the end of the day	0.58	0.48	0.04	S
8	Employers should conduct air monitoring or have documentation that shows exposure limits	0.63	0.52	0.10	NS
9	Workers' average daily exposure must be below 0.75 ppm	0.63	0.52	0.10	NS
10	If workers' peak daily exposure is greater than 0.1 ppm, then the employer must enforce labelling, education and Material Safety Data Sheet (MSDS) requirements	0.65	0.48	0.08	NS
11	MDF furniture should be kept water-free	0.56	0.48	0.10	NS

The result in Table 4 shows that there is no significant difference in the mean responses of both the group of participants for items 1, 2, 3, 4, 5, 6, 8, 9, 10 and 11, therefore, the null hypotheses for these items was upheld while the null hypotheses for item 7 are rejected because it falls below the value 0.05.



Table 4 revealed the result on the perception of safe practices needed to be adopted among the Furniture craftsmen to prevent the effects of Formaldehyde and dust emission from Medium Density Fibreboard on themselves and the people surrounding them in Katsina. Nine items had a calculated sig. 2-tailed value greater than 0.05 and the remaining two items had a calculated sig. 2-tailed value less than 0.05. Therefore, the null hypothesis of no significant difference was upheld for the nine items, while it was rejected for the remaining two items based on the decision rule that items calculated with a value less than 0.05 will be rejected while those with a value greater than 0.05 will be upheld.

## CONCLUSION

Based on the findings of this study, the Furniture craftsmen in Katsina Metropolis are aware that health challenges like allergic rhinitis, chronic Bronchitis, skin irritation and itching can be caused by using Medium Density Fibreboard for furniture, especially during the construction of the furniture. They believe there is a need for adopting safe practices to prevent the effects of Formaldehyde and dust emission from Medium Density Fibreboard. There is no significant difference in the mean responses of the Furniture craftsmen and Environmental Health Workers on the effects of Formaldehyde and dust emission and the safe practices to be employed in preventing these effects.

## RECOMMENDATIONS

Based on the findings, the following recommendations were made:

1. The Katsina Association of Furniture craftsmen and management of the furniture factories should make it a duty to ensure safe practices are adhered to in all places of furniture making in the state.
2. The Health Departments in all the local governments in the state should ensure that all furniture factories in operation must adhere to safe practices outlined for woodworking.
3. The idea that a body of knowledge belongs to a specific profession should be abandoned, particularly in areas such as health, security, and others. As a result, in addition to being professionally grounded, everyone should broaden their horizons to include other important aspects of life.

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