



Research Article

A PRELIMINARY STUDY ON THE EFFECT OF CHALK DUST ON HUMAN HEALTH

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ABSTRACT

The chalk used in educational institutions is of two types, dusting chalk and non-dusting chalk. The regular dusting chalk produces a finer and lighter dust, which is more likely to linger in the air and be breathed in. Non-dusting chalks produce a heavier dust that is less likely to linger in the air. In most of the cases, a lot of the dust is heavier and do not tend fly at all. It is very similar to the regular dusting chalk and still creates dust. The ultimate difference lies in the fact how fine the dust is. Since the dusting chalk paves the way for many allergies this was becoming a problem. But on the other hand, the non-dusting chalks have more chemical composition when compared to dusting chalk. As both the chalks have different compositions, they have their own effect on human health. The present study explores human exposure to the harmful dust when chalk is used for teaching. In this study, a preliminary attempt was made to observe the varied responses of people of various age groups to share their responses on the effects of chalk in their lives through a structured survey. Various health issues caused were reported based upon the dust they were exposed to and concluded accordingly.

Keywords: Dusting chalk, Non-dusting chalk, Coloured chalk, Lighter dust.

INTRODUCTION

The main component of chalk is calcium carbonate (CaCO_3), a basic form of limestone. It was first designed in the form of sticks to suit the needs of artists. With advancement of time, when more number of students started enrolling for education, teachers found it convenient to use it for conveying information along with blackboards. Small chalkboards were used for studying and practicing homework, especially among the younger students. Presently, most of the chalk produced is dustless. As the chalks used earlier were of the dusting type, many people started experiencing respiratory issues. In order to satisfy the needs of the customers, chalk manufacturing companies came up with the idea of the non-dusting chalk. It is aproven fact the non-dusting chalk contains more chemical components when compared to that of dusting chalk as a result of which, the dust particles formed happen to be much larger and heavier. The present study will throw light

upon the various health issues caused due to usage of the two types of chalk that are commonly used in educational institutions.

MATERIALS AND METHODS

In the present study, 362 individuals of various age groups were surveyed about their encounter with chalk and the side effects they faced due to the usage of chalk. A survey questionnaire was designed using Google forms and was shared via online to the respondents through various social platforms such as Email, Whatsapp and Instagram. The questionnaire was split into three divisions.

Personal information

The respondent's personal information with regard to educational institution they belong. The options provided were schools/colleges/others. Secondly the age group which ranged from the least 12 years to a maximum age group of 60 years.

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Access to use of chalk in their lives

The respondents were interrogated if they had access to use of chalk in their lives and the type of chalk that they use/ have used. It also included questions on the quality of chalk and the frequency of use of it in their daily work experience.

Symptoms due to the usage of chalk

In this category the individuals were asked to answer if they had any symptoms due to the usage of chalk.

RESULTS AND DISCUSSION

A group of 362 individuals took part in this survey ranging from ages 12-60. Out of this, 6.4% belonged to the age groups 12-17, 37.8% in the age groups 18-23, 8% belonged to 24-29, 22.4% in 30-40 age groups, 15.2% in age groups 40-50 and 10.2% belonged to age groups 50-60. From the study population 92% of the population use chalk in their educational institutions and the rest the 8% use markers and other equipments designed for learning. Out of this 92%, 62.2% respondents expressed that dusting chalk causes more impact on human health, whereas 16% of the respondents explained that non-dusting chalk caused more impact. 9.1% of the individuals felt that coloured chalk had most of the impact. Since the respondents were mostly from colleges so their age groups ranged between 18-23

constituting the highest percentage of 37.8%. The next age group ranging between 30-40 constituted 22.4% and thereby included the teachers and professors. Age groups from 24-29 had the least percentage with 8% and ages 12-17 had a percentage of 10.2% which included school students. It was also observed that 15.2% are respondents from ages 40-50 and individuals from ages 50-60 constituted 6.4%. It was observed that most of the respondents have expressed that they use dusting chalk in their educational institutions and this has a percentage of 57.5%. The next in line is the non - dusting chalk with an usage rate of 44.5%. The usage of coloured chalk was reported next with 32%. The composition of chalk plays a very important role here. The normal dusting chalk produces more dust because of the lighter dust particles that are made up of CaSO_4 , CaCO_3 / $\text{CaMg}(\text{CO}_3)_2$ and a little amount of organic adhesives such as polyvinyl alcohol. The non-dusting chalk contains calcium sulphate di-hydrate and calcium sulphate hemi-hydrate mixed with poly hydro compound which makes the dust particles heavier than the usual dusting chalk (Figure 1-4). Majority of the respondents (42%) who used chalk expressed that sneezing was the major side effect that was experienced (Figure 5). However, 35.1% expressed that they do not have any respiratory issues due to chalk. On the other hand, 26.8% of the study population reported coughing, 15.2% expressed difficulty in breathing while teaching and 13.3% expressed a burning sensation in the throat.

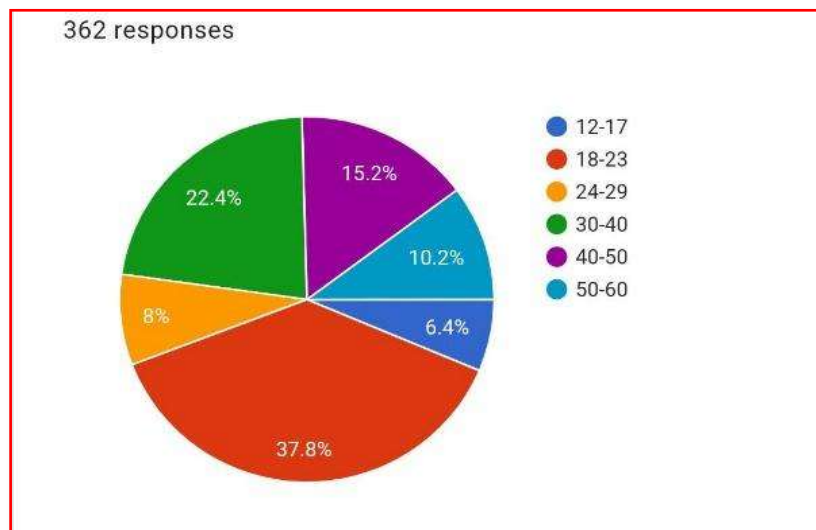


Figure 1. Representing the various target groups.

Table 1. Shows the respiratory issues caused due to the usage of chalk.

Respiratory issues	Difficulty in breathing	Coughing	Sneezing	A Burning sensation in the throat	None
Percentage of the study population	15.2	26.8	42	13.3	35.1

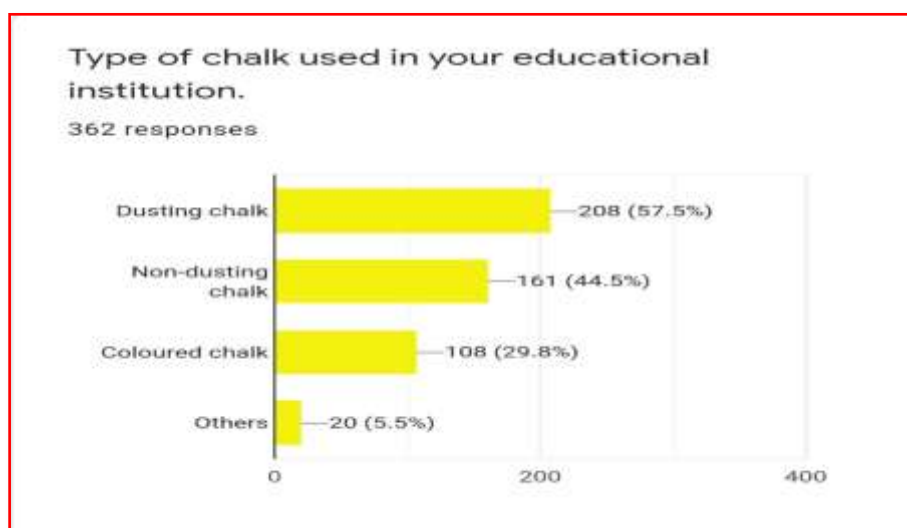


Figure 2. Showing the percentage of different types of chalk used.

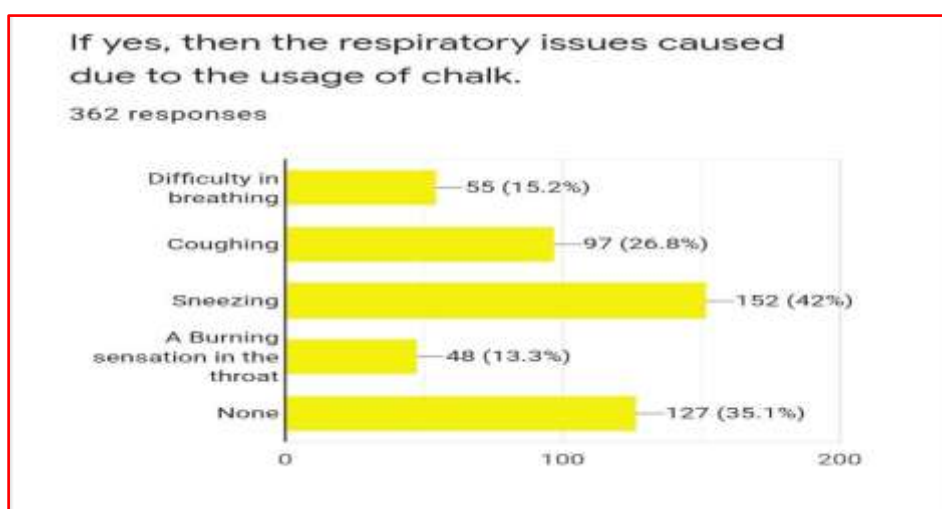


Figure 3. representing the various respiratory issues caused due to the usage of chalk.

Table 2. Representing the skin related problems caused due to the usage of chalk.

Skin problems	Rashes	Itching	Peeling of skin	Dryness/flaky skin	None
Percentage of the study population	10.5	21.5	8.3	24.9	53.3

Table 3. Expressing the various eye related problems caused due to chalk dust.

Eye problems	Redness of the eye	Itching and watering	Swollen Eyelids	Discharge From the eye	None
Percentage of the study population	24.3%	23.5	4.4%	8.6%	53.6%

It was also found out that 53.3% of the target group did not have any skin issues due to the effects of chalk. However, 29.9% of the study population experienced dryness and flakiness in the skin. 21.5% of them suffered from itching, especially in the areas of palms and in-between the fingers as the individual holds the chalk for writing purposes. 8.3% of the study reported peeling of skin. Moving further down to eye related problems; majority of the population did not experience any problem. Redness of the eyes was reported in 24.3% of the study group. 4.4% of the respondents complained about swollen eyelids and 8.6% expressed that they had discharge from the eyes. The interesting part is the individuals who used dusting and non - dusting chalk complained that they have sneezing and coughing. But most of the individuals who suffered from skin related problems seemed to have used non-dusting type of chalk. Hence, we now affirm that the composition of the non-dusting chalk does justice by maintaining heavy dust particles. However, on the other hand the substances that make the particles heavy are highly chemical, thereby causing side effects on the individual. The dust particles of the dusting chalk are so light that it gets easily carried away by the gradual wind that passes in the classrooms. This fall on the individual's eye while teaching. Since the human

eyes are really sensitive, even a small dust particle will result in the lubrication of the eyes. So, regardless of dusting and non-dusting chalk, both are known to cause irritation in the eyes. Another interesting observation is the deposition of dust particles from dusting type of chalk in the Central Processing Unit (CPU) of the computers, which result in tremendous heating up of the system ultimately leading to their failure.

Regardless of their age, individuals who use chalk are exposed to various health conditions such as respiratory, integumentary and ailments in the eyes. Upon further survey, a huge number of respondents also reported that they developed dandruff in their heads use to the usage of chalk. This could possibly be attributed to the fact that deposition of chalk dust on the skin of the scalp results in intense dryness thus serving as a very good environment for the dandruff to grow. Apart from all the symptoms mentioned above, a very minimal percentage of people put forth their health conditions which could possibly be attributed to the usage of chalk. These include bronchitis, allergies, triggering of sinuses, chronic cold throughout the year depending upon the exposure, hair fall, sweaty palms, asthma and headache.

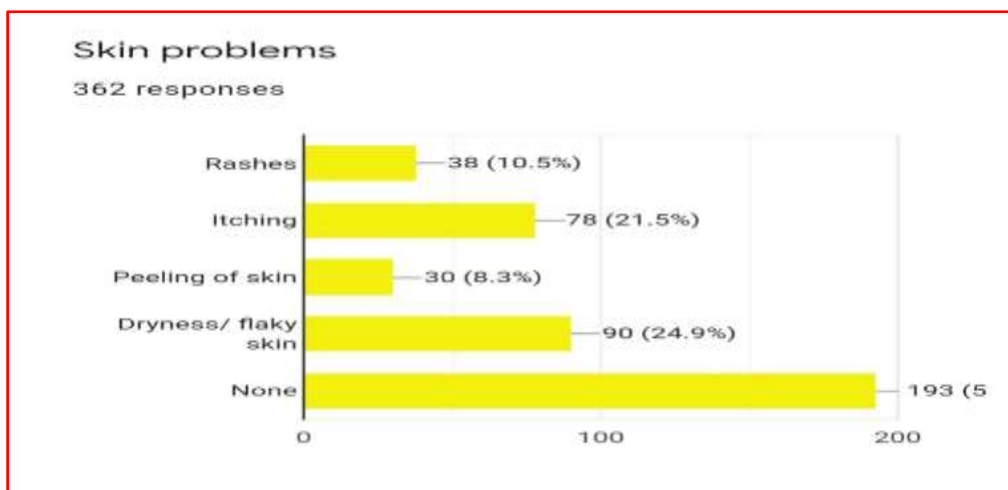


Figure 4. Indicating the various respiratory issues caused due to the usage of chalk.

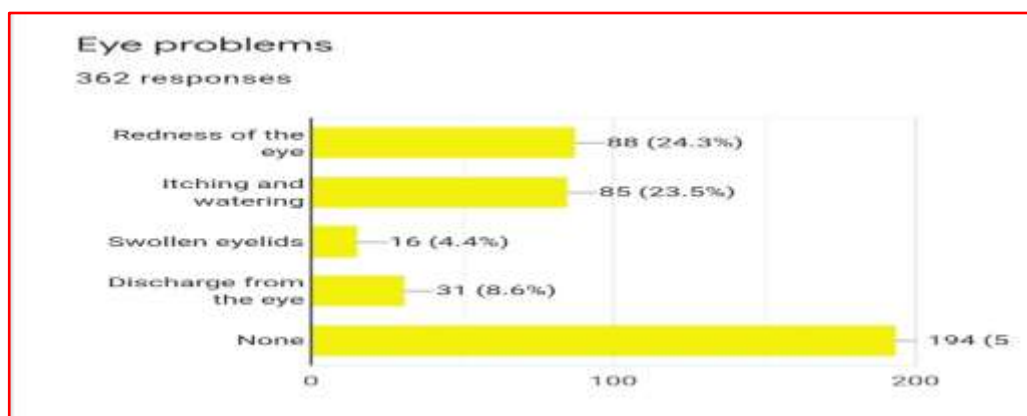


Figure 5. Indicating the various respiratory issues caused due to the usage of chalk.

This study not only explains the harmful effects of chalk on human health in detail but also throws light on the types of chalk, the manufacturing process and also the usage of chalk in classrooms. The health effects include damage caused to various parts of the body such as eyes, lungs, ears, skin and respiratory tract. The present study is also in accordance with chalk dust during writing and dusting exercises in a classroom that was carried out by Deepanjan Majumdar, DG Gajghate, Pradeep Pipalatkhar and CV Chalapati Rao of the National Environmental Engineering Research Institute in Nehru Marg, India. Chalk dust is an irritant that can trigger an asthma attack on humans. It also been observed that chalk can cause the formation of dandruff on the head scalp due to the dryness of skin which occurs due to the settling of chalk dust on the scalp. This is in agreement with a study conducted by Shubham *et al.*, 2008 on effect of chalk dust on the class room environment and on the human body.

Nowadays, technology is playing a very important role in education and is coming up with many innovative ideas. They have introduced computers, projectors, tablets and many more. Not to forget, the use of markers has also taken the place of chalk in many educational institutions. We should also consider the schools and other educational institutes who will not have the access to technology. They give preference to use chalk because of its low economic rate. We must try to provide them the technology they need in the lowest cost for their accessibility. Even in our own schools and colleges they still use chalk due to many reasons such as accessibility, low cost, easily available, traditional learning and many more. Chalk has helped us till this generation. But considering that dusting chalk as well as non-dusting chalk has its own health issues, we should be aware to reduce its use.

CONCLUSION

In the present study, we understand that dusting as well as non-dusting chalk has its own impact on human health and so it is our duty to take care of our health and change our ways. Not much of research work has been done on studying the effects of chalk on human health and therefore this happens to be a pilot study.

Wearing of face masks could be helpful for teachers and safe alternatives towards the same will have to be worked upon in the long run.

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