

## Salt Taste Threshold and Blood Pressure of Labourers Who Smoked Filtered Kreteks

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### Abstract

Construction labourers in Indonesia are mostly classified as former or active smokers. Kreteks are the most popular cigarettes in the country. Studies have shown that smoking can cause high blood pressure and reduce the sense of taste.

The aim of this study was to determine the salt taste threshold and blood pressure of labourers who smoked filtered kreteks.

This descriptive study included 51 labourers selected via a simple random sampling method. The salt taste threshold was tested by dropping sodium chloride solutions in increasing concentrations on the subject's tongue, and the blood pressure was measured using a sphygmomanometer.

The mean salt taste threshold of all subjects was 0.052 M, whereas the mean blood pressure was 120/77 mmHg.

The salt taste threshold of labourers who smoked filtered kreteks was higher than the normal threshold (0.01 M) and tended to increase with age, amount of cigarette consumed and duration of smoking. However, the blood pressure was considered to be within the normal range.

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### Introduction

The economic environment in Indonesia is influenced by informal jobs, which comprise 55% of all professions. These professions are dominated by the construction sector, which has shown the strongest performance over the last decade.<sup>1</sup> Construction labourers are mostly married men with a low educational status and who are classified as former or active smokers.<sup>2</sup>

White cigarettes and kretek (clove) cigarettes are the most popular types of tobacco products in the world, but kreteks are the most widely smoked form of cigarettes in Indonesia.<sup>3</sup> The difference between the two is in their composition. Kreteks contain tobacco and cloves, but these ingredients are not found in white cigarettes. There are also two types of kreteks: filtered and non-filtered. Filters are believed to reduce nicotine and tar levels in the smoke.<sup>4</sup>

Epidemiological studies have shown that

a decrease in blood pressure is noted in people who stop smoking.<sup>5</sup> Therefore, high blood pressure has a negative association with smoking. Smoking affects sensory organs, thereby reducing taste sharpness. The chemical compounds in cigarettes interact with the taste organs or buds and tend to weaken the ability of taste buds to identify various flavours. There are several hypotheses concerning the mechanism underlying taste sensitivity decrease: significant changes in the shape, size and vascularisation of the fungiform papillae; decreases in the number of taste cells; an indirect result of tobacco components impacting the salivary glands and reduced zinc, vitamin B, E and folic acid levels, all of which affect the sense of taste. Another explanation concerning the mechanism underlying the taste sensitivity decrease is that nicotine acts at the central level and modulates the taste signal.<sup>6</sup>

Smokers are likely to add more spices to their food or drinks because their taste function is reduced. One of the seasonings commonly added to enhance the savoury flavour of food is salt. Various studies have proven that salt intake is the most significant cause of increase in blood pressure.<sup>7</sup>

Based on the information and theories described above, it seems that the cause of

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increased blood pressure in smokers, apart from the contents of the cigarette itself, is thought to be the use of salt as a food flavour enhancer. Therefore, we aim to provide an overview of the salt taste threshold and blood pressure of labourers who smoked filtered kreteks.

### Materials and methods

We followed a quantitative descriptive design in this study. The sample comprised 51 labourers who smoked filtered kreteks and was selected via a simple random sampling method.

The salt taste threshold was determined by dropping sodium chloride solution using a pipette on the lateral surface of the subject's tongue. The concentration of the solution was gradually increased, starting from 0.025 M to 0.2 M, with an interval of 0.005 M, until the subject could identify the taste of salt. The subjects were asked to gargle with water before the sodium chloride solution was dropped on their tongues to clean their mouth. The test was performed only once per subject to avoid the effects of adaptation to salt taste.

Systolic and diastolic blood pressures were manually measured using a sphygmomanometer. The measurement was repeated three times for each subject to determine the mean blood pressure.

### Results

The mean salt taste threshold of all subjects was 0.052 M, whereas the mean blood pressure was 120/77 mmHg. Table 1 shows the subjects' mean salt taste threshold and blood pressure according to the three age groups (each with a 10-year interval). The mean salt taste threshold increased with age. Similar tendencies were also observed for systolic and diastolic blood pressures.

Age Group (years)	Mean Salt Taste Threshold (M)	Mean Systolic Blood Pressure (mmHg)	Mean Diastolic Blood Pressure (mmHg)
17-25	0.052	116.7	75.3
26-35	0.058	122.8	82.9
36-45	0.063	128.3	85.6

**Table 1.** The Mean Salt Taste Threshold and Blood Pressure of Labourers who Smoked Filtered Kreteks by the Age Group.

Other factors, such as the amount of filtered kretek consumed per day and duration of

smoking are shown in Table 2. Higher consumption of cigarettes and longer duration of smoking indicated a higher salt taste threshold. This means that the sense of taste decreased with the increase in consumption of cigarettes and duration of smoking. Although the mean blood pressure showed more varied results, it was still considered to be within the normal threshold.

Filtered Kreteks Consumed (per day)	Duration of Smoking (years)	Mean Salt Taste Threshold (M)	Mean Systolic Blood Pressure (mmHg)	Mean Diastolic Blood Pressure (mmHg)
<10	1-10	0.04	122	80
<10	11-20	0.05	128	76
10-20	1-10	0.052	120	77
10-20	11-20	0.06	126	85
>20	1-10	0.066	123	81
>20	11-20	0.08	123	86

**Table 2.** Mean Salt Taste Threshold and Blood Pressure of Labourers Who Smoked Filtered Kretek by the Amount of Filtered Kretek Consumed and Duration of Smoking.

### Discussion

The mean salt taste threshold of the subjects in this study was higher than the normal salt taste threshold (0.01 M). Nicotine from cigarettes that is absorbed on the walls of the blood vessel in the oral cavity could cause vasoconstriction and decrease oxygen circulation (i.e. result in hypoxia).<sup>8,9</sup> Along with distortion of filiform papillae, this condition affects the metabolism and morphology of fungiform papillae by altering the function of capillary vessels and the surface morphology,, thus causing a decrease in the sense of taste.<sup>10,11</sup>

Age can also affect the salt taste threshold. Studies reported that the taste buds of older people have structural declines and degenerate faster.<sup>12</sup> Factors such as the dose of nicotine in cigarettes are suspected to worsen the process of degeneration.<sup>13</sup> Higher salt taste thresholds can lead to a higher total sodium intake and consequently a higher prevalence of hypertension. A study suggested that greater intensity of the salt taste was directly associated with a preference for salty foods and sodium intake.<sup>14</sup> High dietary salt intake challenges the kidneys to excrete large amounts of salt. The mechanism affects the cardiovascular system because it predisposes to high blood pressure to help the kidneys excrete sodium.<sup>15</sup>

This study showed that there was an increase in the salt taste threshold of labourers who smoked filtered kreteks, but their blood pressure remained within the normal range. Fischer et al. also found no significant relationship between the intensity of salt taste and the hypertension status or mean blood pressure.<sup>13</sup> Their study indicated a weak trend in the odds of hypertension as the intensity of salt taste increased, particularly in participants with no history of physician-diagnosed hypertension, but the trend was insignificant. However, the study still suggested that understanding the sensory and hedonic effects of salt taste on total sodium intake is of fundamental importance in the campaign to have the general population reduce sodium intake and thereby impact the risk of hypertension.<sup>16</sup>

The mean blood pressure of the subjects in this study was considered to be optimal and within the normal threshold but tended to be high. This shows that smoking can not only result in an increase in the salt taste threshold but also result in higher blood pressure. Carbon monoxide (CO) in cigarettes has a greater affinity for haemoglobin than oxygen. Therefore, when tobacco smoke is inhaled, despite the decrease in oxygen levels in the atmosphere, the red blood cells lack oxygen too because CO is dominating the content of the atmosphere.<sup>17</sup> The heart, therefore, needs to pump more blood to deliver enough oxygen to the body, which causes hypertension.

## Conclusions

Based on the result of the study, the salt taste threshold of labourers who smoked filtered kreteks was found to be higher than the normal threshold. This threshold tended to increase with age, amount of cigarette consumed and duration of smoking. Conversely, blood pressure was considered to be normal.

## Declaration of Interest

The authors report no conflict of interest.

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