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The relationship between smoking status and salivary flow rate in inhaled general anesthesia patients at Brebes Regional Hospital

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Abstract

Background*: Smoking is one of the habits that is inherent in humans because it is addictive. Active smokers in Indonesia have increased significantly in 10 years. Smoking has a negative impact on health, one of which is changes in salivary flow rate. Changes in salivary flow rate in smokers can cause complications in the airway when performing surgery using inhalation general anaesthesia. The purpose of this study was to determine the relationship between smoking status and salivary flow rate in patients with inhalation general anaesthesia.*
Method*: This type of research is observational analytic with a cross sectional approach. The sample in the study was 35 respondents with 4 inclusion criteria. The sample in this study was taken with purposive sampling technique. Data collection stimulated saliva by suction method. Data analysis using univariate and bivariate analysis, namely the Chi-Square test.*
Results*: The results showed that inhalation general anaesthesia patients were more smokers with 24 respondents (68.6%) and respondents who experienced changes in salivary flow rate obtained the most respondents who experienced hypersaliva as many as 15 respondents (42.9%). The results of bivariate analysis using the Chi-Square test showed that 11 respondents (31.4%) who smoked experienced hypersaliva with a p-value of 0.000 <0.05.*
Conclusion*: There is a relationship between smoking status and salivary flow rate in inhalation anaesthesia patients, namely the increase in salivary flow rate in smoking respondents with inhalation general anaesthesia.*

Key words: *Smoking status, hypersalivation, salivary flow rate*

INTRODUCTION

Smoking is one of the habits that is inherent in every human being and is the biggest threat to health in the future. Based on the Global Adult Tobacco Survey (GATS) in 2021, in the past 10 years, active smokers in Indonesia have increased significantly, increasing by 8.8 million people so that Indonesia remains the country with the largest number of smokers in the Association of Southeast Asian Nations (ASEAN) (1). According to the Central Java Statistics Agency in 2021, the last 3 years the population aged 15 years and over who smoke has increased significantly with Brebes Regency in 7th position with 75.26% (2).

Cigarettes contain harmful substances that have a toxic impact on the body, one of which is the oral cavity which is the way to enter these substances, causing structural and functional changes in saliva. The heat generated from cigarette smoke makes vascularisation and salivary secretion undergo changes that affect the salivary flow rate (3). Research by Bayraktal et al (2002) states that smokers experience an increase in salivary flow rate (4). Meanwhile, research conducted by Nelis (2018) states that more respondents experience low salivary flow rate (3). Research conducted by Yendri et al (2018) states that changes in salivary flow rate depend on the duration of smoking because it is related to the concentration of nicotine in cigarettes. Initially nicotine increases the salivary flow rate but over time it will reduce the salivary flow rate (5).

A person who performs surgery will be anaesthetised first to fulfill the triad of anaesthesia including sedation, namely

drowsiness / calm, analgesia or no pain, muscle relaxation, namely muscle paralysis (6). General anaesthesia methods or techniques are divided into 3, namely inhalation general anaesthesia techniques, intravenous general anaesthesia and draw general anaesthesia (7).General anaesthesia techniques are performed by injecting parenteral anaesthetic drugs directly into the vein. Intravenous anaesthetic drugs include opioid narcotics, namely ketamine HCl, thiopentone, propofol, diazepam, dehydrobenzperidol, midazolam, pethidine, morphine, fentanyl, sufentanil which can lead to complications (8).

Smokers who perform surgery using inhaled general anaesthesia experience hypersecretion due to the malfunction of the body's physiological reflexes due to anaesthetic drugs, causing accumulation in the respiratory tract resulting in airway obstruction. The accumulation of saliva in the airway results in airway obstruction related to oxygen intake to the body, as a result often showing a decrease in saturation which can cause hypoxia or hypoxemia (9). So the researcher is interested in conducting a study to determine the relationship between smoking status and salivary flow rate in patients with inhalation general anaesthesia.

METHODS

This study is a type of quantitative research with observational analytic research design using cross sectional. This research was conducted by studying medical record documentation to see smoking status. Furthermore, observation and measurement of salivary flow rate stimulated using the suction method during extubation (10). Salivary flow rate was determined by dividing the scale of the volume of saliva collected with the length of time for saliva collection with units (ml/min). This study used univariate data analysis to see the distribution and percentage of each variable and bivariate analysis using the Chi-Square Test to test the analysis of two variables that were thought to be related (11).

This research has been conducted at Brebes Hospital with the research ethics number B.LPPM-UHB/2040/07/2023. The population in this study were all patients who underwent surgery in August 2023. This study used purposive sampling technique, namely samples taken according to the population with the desired researchers so that they represent the characteristics (12). Where the sample in this study were patients who performed surgery using inhalation general anaesthesia. The sample criteria used in this study are:

1. Inclusion Criteria
   a. Type of elective or stat surgery with inhalation general anaesthesia Laryngeal Mask Airway (LMA) and Endotracheal Tube (ETT).
   b. Undergoing surgery for 30-90 minutes.
   c. Intubation is done only once.
   d. ASA physical status I and II.
2. Exclusion Criteria
   a. Patients who refuse to be research respondents.
   b. Intubation was performed more than once.

RESULTS

Based on table 1 below, the results of the smoking status of respondents who smoke are 24 respondents (68,6%) and respondents who don't smoke are 11 respondents (31,4%).

Table 1. Smoking Status of Respondents

Variables	f	%
Smoking Status		
Smoking	24	68.6
Non Smoking	11	31.4
Total	35	100

Based on table 2 below, the results of salivary flow rate in respondents who experienced hyposaliva were 4 respondents (11.4%), respondents who experienced low were 9 respondents (25.7%), respondents who experienced normal were 7 respondents (20%), and respondents who experienced hypersaliva were 15 respondents (42.9%).

Table 2. Salivary Flow Rate Respondents

Variables	f	%
Salivary Flow Rate		
1. Hiposaliva	4	11.4
2. *Low*	9	25.7
3. Normal	7	20
4. Hipersaliva	15	42.9
Total	35	100

Based on table 3 below, the results of the analysis show that respondents who smoke with a hyper salivary salivary flow rate category are 11 respondents (31.4%). The results of the Chi-Square Test obtained showed a *p-value* of 0.000 <0.05, so it can be concluded that there is a relationship between smoking status and salivary flow rate in patients with inhalation general anaesthesia.

Table 3. Results of Analysis of The Relationship between Smoking Status and Salivary Flow Rate

Variables	Smoking Status						p
	Smoking		No Smoking		Total		
	f	%	f	%	f	%	
Salivary Flow Rate							
Hiposaliva	4	11.4	0	0	4	11.4	0.000
Low	9	25.7	0	0	9	25.7	
Normal	0	0	7	20	7	20	
Hipersaliva	11	31.4	4	11.4	15	42.9	

DISCUSSION

Based on the results of the research conducted, it was found that of the 24 respondents who smoked, the majority of the salivary flow rate was in the hypersaliva category, namely 11 people (31.4%). This research is in line with research conducted by Setyowati et al (2022), where active smokers have an average salivary flow rate increased. (13). This is influenced by active compounds in cigarettes such as nicotine which affect the circulation, brain and autonomic nerves, causing biological imbalances resulting in increased salivary flow rate (14). These results are in line with research conducted by Khan et al (2010) that chemicals stimulate salivary flow rate where the pattern of sensation of rada and saliva secretion in humans follows nicotine which activates lingual sensory neurons which are associated with increased salivary flow rate (15).

Hypersalivation is the continuous flow of saliva due to a stimulus that triggers a surge of water. Hypersalivation or drooling is caused by increased saliva secretion (sialorrhea) from overstimulation of salivary glands, decreased saliva clearance from oropharyngeal muscles, or both (16).

This increase in saliva occurs in smoking respondents due to the effects of heat generated from burning cigarettes can irritate the oral mucosa directly, causing changes in vascularisation and secretion of the salivary glands (17). This increase in saliva is that it is experienced in new smokers or light category smokers because in short-term cigarette use the influence of nicotine will increase the secretion of Ca^{2+} which enters the acinar serl and regulates the activation of ion channels, which are needed for the formation of primary saliva (5).

According to the assumption of researchers in a new smoker nicotine substances in the content of cigarettes are foreign to the body, especially in parasympathetic neurotransmitters. Where this nicotine substance stimulates parasympathetic neurotransmitters causing an imbalance of acetylcholine which makes the secretion of Ca^{2+} increase. When Ca^{2+} increases, smooth muscle contraction also increases so that the salivary flow rate increases causing hypersalivation.

Other cigarette ingredients such as tar and carbon monoxide can have an effect. This tar when cigarettes are burned produces carcinogens that make macrophages and neutrophils infiltrate the epithelium causing epithelial damage. The damage results in the cilia being unable to clear the airway, causing an increase and build-up of saliva. Carbon monoxide can defeat oxygen bound by blood which causes oxygen supply to decrease marked by a decrease in oxygen saturation which can cause hypoxemia and even hypoxia (18).

Another assumption of researchers, the use of nicotine substances in the body for a long term will make smooth muscle fatigue

which makes saliva decrease. In this study, it was seen that smoking respondents who experienced low were 9 people (25.7%) and those who experienced hyposaliva were 4 people (11.4%). This is supported by research by Yendri et al (2018) that nicotine initially increased salivary flow rate, but with further doses reduced salivary flow rate. Prolonged exposure to nicotine causes swelling of acinar cells and results in the number of intra acinar secretory granules increasing. In addition, nicotine causes vasoconstriction which makes bicarbonate ions decrease. Chronic nicotine exposure causes fatigue in salivary gland acinar cells resulting in reduced salivary production (5,19).

Non-smoking respondents who experience hypersalivation, the researcher assumes due to the use of drugs during intubation or maintenance during intra-anesthesia, namely propofol. This drug increases the entry of extracellular calcium into the cytoplasm by potentiating the acinar cell response to ATP mediated by receptors expressed on acinar cells. This significant alteration of calcium causes the opening of chloride channels thereby increasing salivary secretion (20).

When using inhaled general anaesthesia in smoker patients, there is a risk related to airway effectiveness due to the effect of cigarette content which makes changes in salivary flow rate and decreases oxygen and the effect of anaesthesia is the loss of consciousness so that the physiological reflex of swallowing does not function resulting in hypersaliva. This event can cause laryngeal spasm, respiratory failure and airway obstruction due to the presence of foreign bodies, namely excess salivary secretions that create a buildup so that the airway narrows and interferes with salivary flow. If ventilation imbalance occurs, it will cause hypoxaemia and even hypoxia due to low oxygen in the body or prolonged desaturation so that brain cell death can occur(9). This can be treated by clearing the airway using suction to suck saliva and using anticholinergic drugs to reduce hypersalivation, namely atropine sulfate.

CONCLUSIONS

Based on research conducted on 35 respondents in inhalation general anesthesia patients, the following conclusions were obtained:

1. Smoking status in inhalation general anesthesia patients is more smoking as 24 respondents (68,6%).
2. Salivary flow rate in inhalation general anesthesia patients experienced more hypersaliva as many as 15 respondents (42,9%).
3. There is an association between smoking status and salivary flow rate with *p-value* of 0.000 in patients under inhalation general anesthesia

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