PREVALENCE OF PERIODONTAL DISEASE IN STUDENTS AT SMP NEGERI 23 MAKASSAR BASED ON THE *COMMUNITY PERIODONTAL INDEX* (CPI)

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Thesis

As one of the requirements to achieve a bachelor's degree of Dentistry Education

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AND COPYRIGHT ASSIGNMENT

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Makassar, November 29th 2024

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APPRECIATION REMARKS

All praise and gratitude to Allah Swt. for all His grace and guidance, so that the author can complete this thesis properly and on time. The research that I conducted was carried out successfully and this thesis was completed with the guidance, discussion and direction from Supiaty, drg., M.Kes as the supervisor, Prof. Dr. Hasanuddin, drg., M.S., Sp.Perio (K) as the examiner lecturer 1, and Dr. Asdar, drg., M.Kes as the examiner lecturer 2. I thank them abundantly. I also express my high appreciation to the Dean of the Faculty of Dentistry, Irfan Sugianto, drg., M.Med.Ed., Ph.D. I would also like to express my gratitude to the leadership of Hasanuddin University for facilitating me to pursue my undergraduate program as well as the lecturers and staff of the academic community. I also thank my beloved mother and my father who always pray, support and motivate me in every life journey I face. I also express my great appreciation to my 2021 incremental friends, especially Tiwi, Nanda, Ailsa and also my family and cousins for their invaluable motivation and support. Then I also want to thank Enhypen for motivating me, especially Park Jongseong who always encourages me through his work. May Allah SWT always give blessings, happiness, and success to all who have helped the author in completing this thesis. Thanks.

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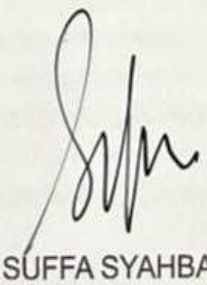

NUR SUFFA SYAHBANIA

ABSTRACT

NUR SUFFA SYAHBANIA. **Prevalence of Periodontal Disease in Students at SMP Negeri 23 Makassar Based on the *Community Periodontal Index* (CPI)** (supervised by drg. Supiaty, M.Kes)

Background. Periodontal disease is defined as a condition of inflammation and degeneration of the soft tissues and bone supporting the teeth. Periodontal disease is chronic, cumulative and progressive. Adolescents will experience physical, emotional and social changes, characteristics of puberty which are characterized by swelling of the gingiva, red color, and poor oral hygiene in adolescence. Hormonal changes and instability that occur in adolescence are also the cause of gingival inflammation, because in adolescence the gums experience inflammation and become more sensitive. **Objective.** this study was to determine the prevalence of periodontal tissue disease in students of SMP Negeri 23 Makassar based on the *Community Periodontal Index* (CPI) index. **Methods.** used was descriptive observational research with a *cross sectional study* design . The research sample was 100 students in grades 7-9 of SMPN 23 Makassar. **Results.** showed that the prevalence of periodontal disease in students of SMP Negeri 23 Makassar based on the *Community Periodontal Index* (CPI) index in female and male gender with a score of 2 (there is calculus) as many as 42 subjects and 11 subjects. In addition, at the age of 13 years with a score of 2 (there is calculus) as many as 20 subjects. **Conclusion.** Based on the results of the research conducted on the students of SMP Negeri 23 Makassar, it was found that the highest score based on *the community periodontal index was* a score of 2 (there was calculus and bleeding at the time of probing) at the age of 13 years as many as 20 subjects or 20%.

Keywords: prevalence, periodontal disease, students, *Community Periodontal Index* (CPI)

ABSTRAK

NUR SUFFA SYAHBANIA. **Prevalensi Penyakit Periodontal Pada Siswa di SMP Negeri 23 Makassar Berdasarkan Indeks *Community Periodontal Index* (CPI)** (dibimbing oleh drg. Supiaty, M.Kes)

Latar Belakang. Penyakit periodontal didefinisikan sebagai suatu kondisi peradangan dan degenerasi dari jaringan lunak dan tulang penyangga gigi. Penyakit periodontal bersifat kronis, kumulatif dan progresif. Pada masa remaja akan mengalami perubahan fisik, emosi dan sosial, ciri-ciri masa pubertas yang ditandai dengan pembengkakan pada gingiva, berwarna merah, dan oral hygiene yang buruk pada usia remaja. Perubahan dan ketidakstabilan hormon yang terjadi pada masa remaja juga menjadi penyebab terjadinya peradangan gingiva, karena pada masa remaja gusi mengalami inflamasi dan menjadi lebih sensitif. **Tujuan.** penelitian ini untuk mengetahui bagaimana prevalensi penyakit jaringan periodontal pada siswa SMP Negeri 23 Makassar berdasarkan indeks *Community Periodontal Index* (CPI). **Metode.** yang digunakan adalah penelitian observasional deskriptif dengan desain *cross sectional study.* Sampel penelitian 100 siswa kelas 7-9 SMPN 23 Makassar. **Hasil.** menunjukkan bahwa prevalensi penyakit periodontal pada siswa SMP Negeri 23 Makassar berdasarkan indeks *Community Periodontal Index* (CPI) pada jenis kelamin perempuan dan laki-laki dengan skor 2 (terdapat kalkulus) sebanyak subjek 42 dan 11 subjek. Selain itu, pada usia 13 tahun dengan skor 2 (terdapat kalkulus) sebanyak 20 subjek. **Kesimpulan.** Berdasarkan penelitian yang dilakukan pada siswa SMP Negeri 23 Makassar ini didapatkan bahwa skor terbanyak berdasarkan *Community Periodontal Index* (CPI) yaitu skor 2 (terdapat kalkulus dan perdarahan pada saat probing) pada usia 13 tahun sebanyak 20 subjek atau 20%.

Kata kunci : prevalensi, penyakit periodontal, siswa, *Community Periodontal Index* (CPI)

TABLE OF CONTENTS

TABLE LIST

IMAGE LIST

APPENDIX LIST

CHAPTER 1

INTRODUCTION

1.1. Background

Periodontal tissue is the tissue that supports the teeth so that they remain embedded in the alveolar bone, thus supporting the teeth, so that the teeth do not detach from the socket. The normal periodontal tissue to maintain teeth is supported by four main tissue components, namely the gingiva, periodontal ligament (PDL), cement, and alveolar bone. The gingiva is the part of the oral mucosa that covers the alveolar bone (Nurniza, 2021). Based on its anatomy, the gingiva can be divided into four parts (Nurniza, 2021): *Marginal gingiva* (free gingiva gingiva), sulcus gingiva, *attached gingiva*, and interdental gingiva. (Reddy, 2018). The periodontal ligament fills the space or gap between the bony tooth socket and the tooth root. (Reddy, 2018) (Bathla, 2017). The cement is a calcified and avascular mesenchymal tissue that covers the surface of the anatomical roots. The cement root as part of the tooth and part of the periodontium. The cement provides adhesion to the collagen fibers from the periodontal ligament to the surface of the root. It serves as a root surface covering, a seal for the exposed dentin tubules thus, preventing dentin sensitivity. The alveolar bone is the part of the upper jaw and lower jaw that forms and supports the tooth socket (alveoli) (Bathla, 2017).

Periodontal disease is a condition of inflammation and degeneration of the soft tissues and supporting bones of the teeth. Periodontal disease is chronic, cumulative and progressive (Aliyah et al., 2022). There are two types of periodontal diseases , namely gingivitis and periodontitis. Gingivitis is an inflammation that involves the soft tissue around the teeth, namely the gingival tissue. The clinical picture of gingivitis is the appearance of reddish color on the gingival margin, enlargement of blood vessels in the subepithelial connective tissue, loss of keratinization on the surface of the gingiva and bleeding that occurs during probing (Purwaningsih et al, 2021). The chronic invasion of plaque bacteria below the gingival margin results in gingivitis, if gingivitis continues it can result in periodontitis (inflammation of the periodontal tissue), up to teeth shaking and falling out (Nia, 2019) (Putri et al., 2022). Periodontitis is an inflammatory disease that is associated with microbes and is mediated by a host that causes damage to the periodontal attachment. The pathophysiology is characterized by activation of proteinases associated with microbes originating from the host that allow the loss of marginal periodontal ligament fibers and gingival attachment of connective tissue, the occurrence of apical migration of the junctional epithelium on the root surface, the apical spread of bacterial biofilm along the root surface, the loss of supporting alveolar bone (Putri et al., 2022) (Newman, 2022).

Periodontal disease has a complex etiology, consisting of local and systemic factors. Local and systemic factors are closely related and participate in the damage of periodontal tissue. Chronic diseases are often caused by pathogenic microorganisms found in biofilms or plaque that accumulate around teeth due to poor oral hygiene. Evidence suggests that periodontal disease develops when the number of Gram-negative and anaerobic bacteria in subgingival plaques increases. Several studies have been conducted to identify bacterial species that cause periodontal disease. Microorganisms associated with periodontal disease are Aggregatibacter (Actinobacillus), Porphyromonas gingivalis, Tannerella forsythensis, and spirochaete Treponema denticola. In addition, some systemic diseases and their treatment also have periodontal manifestations (Al-Ghutaimel et al., 2014). In addition, many factors can affect periodontal disease, ranging from socioeconomic factors, infections or sources of infection, including local and systemic, environmental, behavioral, residential area, genetics, and health services. Local factors such as plaque and tartar (calculus), tooth extraction, tooth repair, due to tooth extraction, use of braces, crowded, missing, while systemic factors include diabetes mellitus, psychosomatics, stress and nutrition. Behavioral factors include smoking or chewing habits and brushing habits (Surya et al., 2019). Age factors can also affect periodontal health, especially in adolescence.

Based on *Classification of Periodontal and Peri-Implant Diseases and Condition 2017*, divided into :

a. *Periodontal health and gingival disease and conditions : periodontal health and gingival health, gingivitis: dental biofilm-induced, gingival disease: non dental induced* (Chapple, Mealey, et al. 2018) (Trombelli et al. 2018)
b. *Periodontitis: necrotizing periodontal disease, periodontitis, periodontitis as a manifestation of systemic disease.* (Papapanou, Sanz et al. 2018) (Jepsen, Caton et al. 2018) (Tonetti, Greenwell, Korman. 2018)
c. *Other condition afecting the periodontium : systemic disease or condition affecting the periodontal suppoting tissues, periodontal abscesses and endodontic-periodontal*
   lesions, mucogingival deformities and conditions, traumatic occlusal forces, tooth and prosthesis related factor. (Papapanou, Sanz et al. 2018) (Jepsen, Caton et al. 2018)
d. *Peri-implant disease and conditions : Peri-implant health, Peri-implant Mucositis, Peri-implantitis, Peri-implant soft and hard tissue deficiencies.* (Berglundh, Armitage et al. 2018)

Initial lesions of gingivitis develop within 2-4 days after plaque accumulation, no signs of inflammation are visible, and are characterized by dilation of blood vessel tissue and increased permeability of gingival blood vessels (M A Intan Suhana et al., 2020). After 1 week of plaque accumulation, the gingiva appears edematus due to capillary proliferation and continuous vasodilation. The gingiva appears to be slightly swollen, and the gingival sulcus becomes a little deeper.

Advanced lesions are a sign of transition from gingivitis to periodontitis. There is an appearance of further damage from collagen that extends to the periodontal ligaments and alveolar bones. This transition is determined by many factors such as bacterial resistance, host inflammatory response and susceptibility factors including environmental and genetic risk factors. The host immune inflammatory response is the basis for determining in which individuals can develop periodontitis. Early lesions of the development of periodontitis are the appearance of inflammation in the gingiva in response to a bacterial attack. An advanced form of periodontal disease is characterized by tooth wobbly, tooth loss and tooth migration, due to the loss of attachment between the tooth and its supporting tissues. The bacterial biofilm causes inflammation in the gingival tissue and causes swelling so that the sulcus becomes deeper. The inflammatory response spreads to deeper tissues characterized by the breakdown of collagen in connective tissue. (Adnyasari NLPSM et al., 2023)

Adolescence or puberty is a transition period from childhood to adulthood (Eldarita, 2019). The World Health Organization (WHO) defines adolescents as individuals aged 10-19 years. According to the American Academy of Pediatrics, adolescence is divided into three age groups, namely early (ages 11-14), middle (ages 15-17), and late (ages 18-21). According to the World Health Organization (WHO), the incidence of periodontal disease is high among older children and adolescents, with 50% to 100% of 12-year-olds having signs of gingivitis, indicating the risk of periodontal disease among the adolescent population (Xiao and Karapen, 2021). Periodontal disease is clinical evidence caused by a lack of supervision of dental and oral hygiene behavior in adolescents (Pindobilowo et al, 2023). In adolescence, you will experience physical, emotional and social changes, the characteristics of puberty which are characterized by swelling of the gingiva, redness, inflammation of the entire gingiva margin, interdental papillae and poor oral hygiene in adolescence (Klungkung et al, 2017) (Eldarita, 2019). The stress experienced by adolescents due to internal changes and external pressure makes the adrenal glands tired and unable to stabilize hormones. This is due to the presence of hormones that affect metabolism, growth, development, reproduction, and the body's response to stress. These hormones trigger processes that transform adolescents through physical and emotional maturity and the challenges of puberty. Hormonal changes and instability that occur in adolescence are also the cause of gingival inflammation, because in adolescence the gums become inflamed and become more sensitive (Fansurna, 2023) (Eldarita, 2019). Increased endocrine hormones during puberty lead to vasodilation and increased sensitivity to local stimuli such as bacterial plaque biofilm and tartar, leading to inflammation of the gingiva. Endocrine hormones have a significant effect on various organ systems. In gingiva, these hormones affect cell proliferation, differentiation and growth of keratinocytes and fibroblasts. Estrogen is primarily involved in vascular changes, while progesterone stimulates the production of inflammatory mediators. During puberty, estrogen production increases more than 20 times.

Gingiva is the target tissue for steroid hormones and clinical changes in periodontal tissue are observed during periods of hormonal fluctuations. The main effects of these hormones on periodontal tissue include: estrogen affects salivary peroxidase and activates resistance to microorganisms; estrogen stimulates collagen metabolism and angiogenesis; Estrogen and progesterone affect vascular and binding tissue responses on periodontal tissue and are associated with inflammatory mediators (Diah et al., 2018). Furthermore, receptors for the male androgen hormone (testosterone), especially testosterone, are found in periodontal tissue and fibroblasts. Testosterone is also related to bone metabolism. Effects of androgens on periodontal tissue Stimulate matrix synthesis by osteoblasts and fibroblasts on the periodontal ligaments, inhibit the secretion of prostaglandins, reduce the production of interleukin-6 (IL-6) during inflammation and stimulate the proliferation and differentiation of osteoblasts (Bathla, 2017).

According to data from the World Health Organization (WHO), between 10% and 15% of the world's population suffers from periodontal disease, the prevalence of which increases with age. The prevalence of periodontal disease in Indonesia is 96.58%, second only to dental caries (Sawitri et al., 2018). According to WHO data in 2007, the prevalence of gingivitis in children aged 5-14 years is 84.37%; According to Riskesdas 2013 data, 80% of children under 12 years old and almost 100% of adolescents aged 14 years experience gingivitis due to hormonal influences (Sriani, 2019). The prevalence and severity of periodontal disease increases with age. According to the results of the 2018 Indonesian Basic Health Research, it shows that the prevalence of periodontal disease is quite high, especially the prevalence of periodontitis with a percentage of 74.1% (Ulfah, 2023). In addition, in the group of children between 11-17 years old, the prevalence of gingivitis is quite high in children aged 11 and 12 years. The high prevalence of gingivitis at that age is related to the increase in hormones that occur during puberty. In addition to hormonal factors, gingivitis is also affected by a lack of knowledge about the maintenance of dental and oral hygiene. The enlargement of the gingiva is the result of the presence of local irritant factors such as plaque and calculus, while hormonal changes that occur during puberty will aggravate the enlargement of the gingiva (Nurniza, 2021). Other factors may be caused by a lack of regular dental and oral hygiene. This condition is related to the level of dental and oral hygiene, the worse the level of dental and oral hygiene, the more susceptible it will be to gingivitis (Sriani, 2019).

Based on the explanation above, the author makes this a study on how the prevalence of periodontal disease in Makassar City, especially in SMP Negeri 23 Makassar based on the *Community Periodontal Index* (CPI) with the consideration that the community has not paid attention to the importance of periodontal tissue health.

1.2 Problem Formulation

Based on the background that has been explained, the formulation of the problem can be taken, namely What is the prevalence of periodontal disease experienced in students at SMP Negeri 23 Makassar based on the *Community Periodontal Index* (CPI)?

1.3 Research Objectives

The purpose of this study is to find out how the prevalence of periodontal tissue disease in students of SMP Negeri 23 Makassar is based on the *Community Periodontal Index* (CPI).

1.4 Research Benefits

The benefit of writing this thesis is that it is expected to provide information about periodontal disease to students at SMP Negeri 23 Makassar, and is also expected to foster a sense of awareness in students at SMP Negeri 23 Makassar about the importance of maintaining health in teeth and mouth, especially in periodontal tissue.

CHAPTER II

RESEARCH METHODS

2.1 Type of Research

The type of research used is observational descriptive.

2.2 Research Design

This study uses the *cross sectional study method.*

2.3 Place and Time of Research

2.3.1 Research Venue

This research was conducted in Makassar City, precisely at SMP Negeri 23 Makassar

2.3.2 Research Time

The research was conducted on February 16, 2024

2.4 Research population and sample

2.4.1 Research Population

The population of this research is 905 students of SMP Negeri 23 Makassar.

2.4.2 Research Sample

The sample of this study is students of SMP Negeri 23 Makassar, taken based on grade levels consisting of grade 7, grade 8, and grade 9. An examination will be carried out by means of CPI measurement provisions on teeth using a periodontal probe. The sample was calculated using the Slovin technique according to Sugiyono, 2011. The Slovin formula for determining the sample is as follows:

$$n = \frac{N}{1+N(e)^2}$$

$$= \frac{905}{1+905(0,1)^2}$$

$$= \frac{905}{10,05}$$

$$= 90$$

So after calculating using the Slovin Formula according to Sugiyono 2011, a sample of 90 samples was obtained. The sample will be rounded up to 100 samples.

Information:

n = sample size/number of respondents

N = population size

e = percentage of sampling error tolerance that is still tolerated.

In the Slovin formula there are the following provisions:

Value e = 0.1 (10%) for large populations

Value e = 0.2 (20%) for a small population

So the range of samples that can be taken from the Slovin technique is 10% of the population.

2.5 Sample Criteria

2.5.1 Inclusion Criteria

1. Willing to conduct an examination of the condition of his periodontal tissue as a research subject
2. The sample to be taken is grades 7-9 of SMP Negeri 23 Makassar

2.5.2 Exclusion Criteria

If at the time of the examination of the periodontal tissue the patient suddenly refuses to be the subject.

2.6 Sampling Method

The method used is *consecutive sampling* which is a sampling technique where all subjects who meet the selection criteria are included in the study until the required number of subjects is met. In this study, samples were taken from students who met the sample criteria at SMP Negeri 23 Makassar and then taken based on grade levels consisting of grades 7, 8, and 9.

2.7 Research Variables

2.7.1 Variables by function:

Dependent Variable : Periodontal disease

Independent Variable : students at SMPN 23 Makassar

2.7.2 Variables according to their measurement scale:

Ratio : *Community Periodontal Index* (CPI)

2.8 Variable Operational Definition

a. The prevalence of periodontal disease is the number of incidences in people who suffer from diseases in the dental support tissue or periodontal tissue.
b. To find out how many people suffer from periodontal disease and measure the condition of periodontal tissue, a measurement index is needed. One of the measurement indices that can be used is *the Community Periodontal Index* (CPI).
c. *The Community Periodontal Index* (CPI) is an index used by WHO to measure the condition of periodontal tissue (Dhingra, 2011).

d. The sample will be taken based on the grade level consisting of grades 7, 8, and 9 in SMP Negeri 23 Makassar.

2.9 Tools and Materials

The tools and materials used in this study include:

a. Diagnostic tools (mouth glass, sonde, tweezers)
b. *Nier Becken*
c. Periodontal probe WHO CPI
d. Alcohol 70%
e. Glass and water
f. Cotton and tissue
g. *Betadine*

2.10 Research Procedure

1. Students at SMP Negeri 23 Makassar will be recorded and determined based on age using the *Consecutive Sampling Method.*
2. Examination of gingival status and periodontal tissue status was carried out on 6 sextans to obtain the status of periodontal tissue based on the *Community Periodontal Index* (CPI) criteria.
3. Explain the severity of the status of the periodontal network using *the Community Periodontal Index* (CPI).
4. The process of checking the pocket with a probe is carried out in the following way:

   The type of probe used is the periodontal CPI WHO probe, using a probe that the CPI has a *ball tip* of 0.5 mm, and a black ring at a distance of 3.5mm - 5.5mm, and also at a distance of 8.5mm - 11.5 mm (Dhingra, 2011).

Figure 1 *WHO CPI Probe*

Sumber :

https://www.ebay.com/itm/334934935432?chn=ps&mkevt=1&mkcid=28

Probing depth is a measurement of the depth of the sulcus or periodontal pocket. It is determined by measuring the distance from the gingival margin to the base of the sulcus or pocket using a periodontal probe.

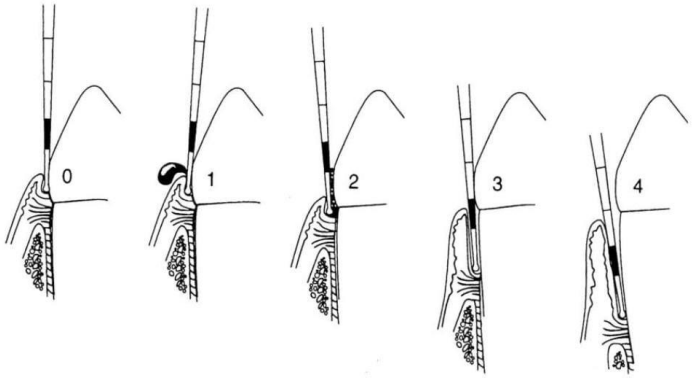

Figure 2 Probing on periodontal tissue

Source : Mason, Jill. 2010. Concepts in Dental Public Health. 2nd ed. Philadelphia: Lippincott Williams and Wilkins. P. 196

The depth of probing is obtained from 6 points on each tooth, namely 3 parts of the facial / buccal surface; (1) buccal/facial, (2) mesiobuccal/mesiofacial, (3) distobuccal/distofacial. Then, 3 parts of the lingual surface; (1) lingual, (2) mesiolingual, (3) distolingual using the WHO CPI probe and mirror. The assessment to be used from each sect is the deepest probing result (Hill, 2014)

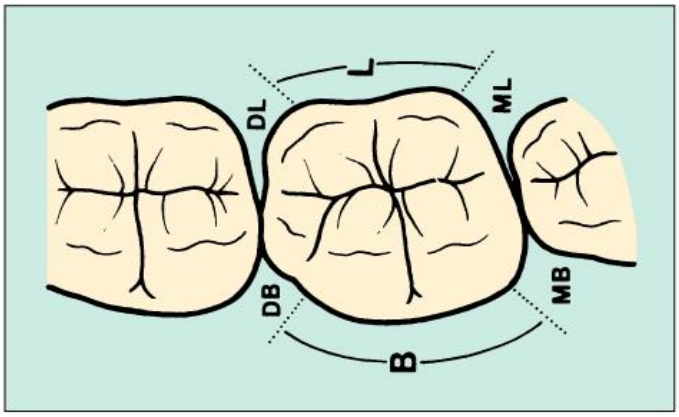

Figure 3 Probing technique

Source [Perio 102 - Austin Dental Careers]

2.11 Measuring Instruments And Measurement

The measuring tool used in this study using the *Community Periodontal Index* (CPI) is a quick and easy method to assess and describe the periodontal status of a community as a whole recommended by WHO.

***Community Periodontal Index* (CPI)**

a. It was introduced by the World Health Organization (WHO) in 1997 (Mason, 2010).
b. *The Community Periodontal Index* (CPI) can be used on 6 dental indices if the patient is 20 years old or younger, namely teeth 26, 21, 16, 36, 31, 46 (Mason, 2010)

Interpretation of *Community Periodontal Index* (CPI)

Code of *Community Periodontal Index*	Interpretation
0	Healthy periodontal status, no gingival and periodontal inflammation
1	There is bleeding after probing
2	There is calculus detected during probing and bleeding, but the black line on the probe is still visible
3	There are pockets 4-5mm deep
4	There are pockets 6mm or more deep that identify severe periodontitis
X	Sect not counted (existing teeth <2mm)
9	Not measured

Sumber : Mason, Jill. 2010. Concepts in Dental Public Health. 2nd ed. Philadelphia: Lippincott Williams and Wilkins. P. 196

2.12 Research Data

1. Data types
   The type of data in this study is primary data.
2. Data presentation
   The presentation of data is presented in the form of tables and descriptive descriptions.

2.13 Research Flow