

## Research Report

## Cost effectiveness and quality of life assessment on dental filling and tooth extraction in Balongsari Public Health Center

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### ABSTRACT

**Background:** Dental health services program implementation in Balongsari Public Health Center during three years, 2006 until 2008, have a high average ratio of filling treatment compared to tooth extraction treatment (1:1.79) as compared to the standard set by the Ministry of Health (1:1). Cost effectiveness analysis and quality of life is needed as a form of economic evaluation of costs incurred by the consequences or impacts of health care programs, especially dental filling and tooth extraction, use to help in supporting the process of policy making in health care. The objective of this study was to assess cost effectiveness analysis (CEA) and quality of life (QoL) on dental filling and extraction treatment in Public Health Center. **Methods:** The study was conducted on 31 respondents who received filling treatment and 38 respondents who received tooth extraction. All of the respondents carried out to evaluate the total costs incurred in obtaining treatment and QoL between before and after treatment, which consist of the physical aspects, psychological, social, and economic. **Results:** The average total cost of dental filling treatment of the 31 respondents was Rp. 27,934.45, and in tooth extraction of the 38 respondents at Rp. 22,406.83. The average difference in the QoL, before and after dental filling treatment amounted to 121.25. In extractions, QoL difference in value before and after treatment at 132.36. Cost effectiveness ratio value in dental filling treatment amounted to 230.37, and in tooth extraction at 169.63. **Conclusion:** It is concluded that cost effectiveness ratio in the filling treatment is higher than the extraction, that the tooth extraction treatment is considered more cost effective than filling treatment.

**Key words:** Cost effectiveness analysis, quality of life, dental filling, tooth extraction

### ABSTRAK

**Latar belakang:** Pelaksanaan program pelayanan kesehatan gigi di Puskesmas Balongsari selama tiga tahun, yaitu tahun 2006 hingga 2008, memiliki rata-rata rasio perbandingan perawatan tumpatan dengan pencabutan gigi (1:1,79) yang lebih tinggi dibandingkan dengan standar rasio yang ditetapkan oleh Kementerian Kesehatan (1:1). Analisis efektifitas biaya dan kualitas hidup, dibutuhkan sebagai bentuk dari evaluasi secara ekonomi, dilihat dari biaya yang dibandingkan dengan dampak program pelayanan kesehatan, khususnya perawatan tumpatan dan pencabutan gigi, untuk mendukung proses pengambilan kebijakan dalam pelayanan kesehatan. **Tujuan:** Tujuan penelitian ini adalah untuk menilai cost effectiveness analysis (CEA) dan quality of life (QoL) pada perawatan tumpatan dan pencabutan gigi di Puskesmas Balongsari. **Metode:** Penelitian ini dilakukan terhadap 31 orang pasien yang mendapatkan perawatan tumpatan dan 38 orang pasien yang mendapatkan pencabutan gigi. Pada seluruh responden dilakukan evaluasi total biaya yang dikeluarkan untuk mendapatkan perawatan dan pengukuran kualitas hidup sebelum dan sesudah perawatan, yang terdiri dari aspek fisik, psikologis, sosial, dan ekonomi. **Hasil:** Rata-rata total biaya perawatan tumpatan gigi dari 31 responden adalah Rp. 27,934.45, dan pada pencabutan gigi sejumlah 38 responden sebesar Rp. 22,406.83. Rata-rata nilai selisih QoL, sebelum dengan sesudah perawatan tumpatan gigi sebesar 121.25. Pada pencabutan gigi, nilai selisih QoL sebelum dengan sesudah perawatan sebesar 132.36. Nilai cost effectiveness ratio pada perawatan tumpatan gigi adalah sebesar 230.37, dan pada pencabutan gigi adalah sebesar 169.63. **Kesimpulan:** Dapat disimpulkan bahwa cost effectiveness ratio pada perawatan tumpatan gigi lebih tinggi dibandingkan pada pencabutan gigi, sehingga pencabutan gigi dinilai lebih cost effective atau efektif secara biaya, dibandingkan dengan perawatan tumpatan gigi.

**Kata kunci:** Analisis efektifitas biaya, kualitas hidup, tumpatan gigi, pencabutan gigi

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## INTRODUCTION

Oral health as part of the whole human health have an important role associated with the presence of oral stomatognathic functional, in improving quality and productivity of human resources. Implementation of oral health efforts is one of the public health center's main activities, that are comprehensive, integrated and include the improvement, prevention, healing and rehabilitation of oral health as a basic service unit directly needed to achieve improved quality of oral health services to society and realize the optimal degree of public health according to the vision and mission of the Ministry of Health of the Republic of Indonesia.<sup>1</sup>

Dental health services include dental fillings, tooth extraction and scaling. One of the indicators of program level assessment efforts basic oral health is by looking at the comparison between permanent dental fillings and permanent tooth extraction according to the standard 1:1 ratio set by the Ministry of Health of the Republic of Indonesia. Over the past 3 years i.e. in 2006-2008, the average ratio of permanent dental fillings with permanent tooth extraction in Balongsari Public Health Center is higher (1:1.79) than the standard ratio set by the Ministry of Health (1:1).

Loss of teeth in the oral cavity system, will bring the impact of the occurrence of bone support, which will continue on the issue of masticatory function and balance of facial proportions in general, can occur due to changes in the position of teeth with dental tendencies that still exist have a tendency to fill the empty space left by extracted teeth. Dental filling treatment with tooth preparation before filling process with less precision, would allow the occurrence of secondary infections from bacteria found under filling material. That may lead to the occurrence of secondary caries that sometimes can only be detected when the severity is in high level or when a similar pain in teeth that have been previously filled. Problems arise in post-treatment, will have an impact on patient time and cost that must be paid back for retreatment or continuing the treatment which has been done before.<sup>2,3</sup>

Quality of life related to oral health describes the state of teeth and mouth in social functioning, physical and psychological as well as economically to the activity of a person's life. Assessment of successful treatment later was observed from the loss of the pathological effects of the existing dental problems, assessment of life quality as an analysis of the impact of dental treatment that has been

done, it has a big role in shaping the thinking of person's psychology, involving the assessment or perception and motivation based on the felt experience. Quality of life used in health care field to analyze a person's emotional, social, and physical abilities are normal, including the ability to meet the demands of the activities in daily life as normal, and the impact of illness, can potentially degrade the quality of health-related life.<sup>3</sup>

The oral health impact profile (OHIP) is a good option for identifying dimensions in oral health related quality of life (OHRQoL), since it is one of the most sophisticated and most popular instruments for measuring OHRQoL. The Scientific Advisory Committee of the Medical Outcomes Trust defined a set of attributes and criteria for the assessment of health status and quality-of-life measurement. The conceptual model is particularly well-suited, this instrument is developed by Slade and Spencer, based on a conceptual framework of oral disease and its functional and psychological consequences. The OHIP is grounded on a theoretical framework based on the World Health Organization's International Classification of Impairments, Disabilities, and Handicaps and an accordingly derived multidimensional model of oral health. The OHIP constituted of 49 lengthy questions and partly for this reason there was a need to develop a shorter derivative, the OHIP-14. The OHIP-14 proves to have good statistical properties and validity in the cross-sectional setting. The benefit of using the OHIP-14 is that data can be collected using less fieldwork and respondent burden.<sup>3</sup>

Cost effectiveness analysis was used to help in supporting the process of policy making in health care, because it is a form of economic evaluation of costs incurred by the consequences or impacts of health care programs or performed as a settlement of existing health problems.<sup>4,5</sup> Cost effectiveness analysis as a method that can be applied in the health field to explain the comparative economic impact of spending on the intervention of the health measures is obtained. Cost effectiveness analysis can be used also as a consideration in the decision making process in support of resource management activities related to health care.<sup>4,5</sup>

This study used the method of assess cost effectiveness analysis, the objective of this study was to assess cost effectiveness analysis (CEA) and quality of life (QoL) on dental filling and extraction treatment in Public Health Center.

## MATERIAL AND METHODS

This was an observational descriptive study, namely the analysis of the CEA related to changes of oral health quality of life by using observation approach results obtained from analysis of changes in QoL of patients before and after dental filling treatment and permanent tooth extraction. Quality of life was used to analyze the achievement of treatment results, generated by the patient's care, as a form of post-evaluation of patient's decision making in dental care.

The study uses a prospective study design, by conducting observations and analysis at the time before getting treatment and observation carried back to see the impact through a period of 2 months after post-treatment, to obtain changes in the value of QoL based on OHIP instrument and CEA.<sup>3</sup>

The questionnaire used to refer from the OHIP questionnaire by Slade,<sup>6,7</sup> that questionnaire is translated into Indonesian to see the essence of the question of health-related quality of life of the oral and dental. Based on the concept of essence is then compiled 12 questions related purposes questions and the meaning understood by the respondents, that are divided into four aspects of QoL analysis, i.e. physical aspects, psychological aspects, social aspects and economic aspects.<sup>3,6</sup>

QoL questionnaire using a Likert scale, response categories for the four scales, was: "very often", "often", "very rare" and "never". Physical aspect, consisting of, assessment of how often before treatment and 2 months after treatment, experiencing the impact of the presence of oral and dental before and after treatment by patients, assessed from the onset of pain, chewing, bad breath, sleeping conditions and circumstances of the patient's headache. Psychological aspects, consists of, how often assessment before and 2 months after treatment, experiencing the psychological effects are uncomfortable with the situation by the patient's oral and dental, which was considered of anger or irritability and the depression. Social aspects, consists of, how often the patient do assessment before and 2 months after treatment, experiencing social impacts related to social relations and confidence. Economic aspects, consists of, how often the patient assessment before and 2 months after treatment have been affected by oral and dental conditions of activity or employment and financial circumstances.<sup>6,7</sup>

The populations in this study were patients in dental clinic of Balongsari Public Health Center, who provide dental filling treatment and permanent tooth extraction was observed for 1 month, on 15<sup>th</sup> April to 15<sup>th</sup> May of 2010. The sample used in this research uses total sampling method or using the whole sample is calculated dental filling treatment and permanent tooth extraction on 15<sup>th</sup> April to 15<sup>th</sup> May of 2010 that meet the criteria of the sample, in which patients indicated for dental filling treatment and willing to do interviews, and domiciled in the territory of Balongsari Public Health Center.

Analysis of the total cost referred to in this research is the sum of direct and indirect costs incurred by patients in getting treatment. Direct costs in this study are counter tariffs and treatment tariff, while the indirect costs derived from the sum of the following expenses: Cost of transportation, which cost the patient to go or come to a place of health services; the lost of opportunity costs, i.e. costs incurred patients related expenditure of time working or productive activity to obtain health services; Cost of losses, i.e. costs related to treatment of patients post-treatment problems that been done before; consumption costs, i.e. costs related to patient activities of eating and drinking in the process of getting health care.<sup>4,5</sup>

Analysis of changes QoL of patients, which is obtained from the patient, the result of questionnaire responses oral health-related QoL before and after getting dental filling or tooth extraction. Measurements using a QoL instrument that consists of 4 aspects of analysis, namely: physical aspects, psychological aspects, social aspects, and economic aspects. Analysis of CER calculation of dental filling and permanent tooth extraction, with QoL approach, obtained from the calculation of total cost divided by the change in QoL of patients.<sup>4,6,7</sup>

## RESULTS

On the characteristics of gender, dental filling and tooth extraction patients, that most (69.6%) had a female gender. Most respondents in both men and women get a permanent tooth extraction. Distribution of respondent's age, dental filling and tooth extraction patients, that most (52.2%) with age range between 26-35 years. Most respondents in the age range of 26-35 years and 36-45 years old get a permanent tooth extraction. While the range of 15-25 years most of the respondents receive dental filling treatment.

Job characteristics on the observation showed that most respondents (50.7%) had a job as employees. Most respondents, who worked as employees, had dental filling treatment, and the housewives or who does not work, mostly had permanent tooth extraction. The condition of dental caries was found in dental filling treatment or tooth extraction, the majority (75.4%) obtained a large caries condition. In medium and large caries, most respondents have a permanent tooth extraction care.

Value of direct costs for dental filling treatment and tooth extraction issued by the respondents in this study is equal to the rate paid by the patient at a counter at Rp. 2,500.- and rates dental filling treatment and tooth extraction for Rp.7,500.-. The direct costs incurred by patients for dental filling treatment and tooth extraction is the same, which is Rp 10,000.-.

In assessing the types of indirect costs, the average value of opportunity cost, transportation, and losses, dental toward filling treatment as higher than tooth extraction, while the average value of the cost of consumption at the extractions is higher than dental filling treatment. In the assessment of

indirect costs, which is the sum of the cost of transportation, consumption, the opportunity is lost, and losses, the average value of indirect costs incurred by respondents that had dental filling treatment was higher than tooth extraction. Total cost assessment is shown in the table 1, which is the sum of direct and indirect costs, the average total cost incurred by respondents who had dental filling treatment were greater than permanent tooth extraction.

**Table 1.** Total cost (in Rupiah) value of dental filling treatment and permanent tooth extraction by the respondents

Treatment	Minimum	Maximum	Average	Standard Deviation
Dental filling	13.000,00	75.000,00	27.934,45	19.560,02
Tooth extraction	13.000,00	66.575,00	22.406,83	16.019,93

The sum value describes the quality of life of patients QoL related to oral and dental condition, measured before and after dental filling treatment, is shown in the Table 2. The average value of QoL before treatment respondents experienced an increase in the measurement after treatment. The sum value describes the quality of life of patients QoL related to oral and dental condition, measured before and after tooth extraction treatment, is shown in the table 3. The average value of QoL before treatment respondents experienced an increase in the measurement after treatment. The average difference value of QoL of respondents before and after dental filling treatment lower than the permanent tooth extraction, except on social aspects (Table 4).

**Table 2.** The average of QoL value in before and after dental filling treatment

Aspect	Dental filling			
	Before		After	
	Average	Standard Deviation	Average	Standard Deviation
Physical	86.93	16.25	135.89	11.48
Psychological	28.17	7.14	39.03	2.46
Social	47.93	11.35	74.29	6.88
Economic	77.94	16.48	113.01	10.34
Total value of QoL	240.96	33.12	362.22	23.19

The total cost value is obtained from the sum of the total value of the total cost, i.e. the number of direct and indirect costs, of each respondent in the group of dental filling treatment and tooth extraction. The total value of the excess of the sum obtained QoL overall QoL difference value of each respondent in each group, dental filling treatment and tooth extraction. Table 5 shows the information that the CER of respondents who receive dental filling treatment higher than the tooth extraction.

**Table 3.** The average of QoL value in before and after tooth extraction treatment

Aspect	Tooth extraction			
	Before		After	
	Average	Standard Deviation	Average	Standard Deviation
Physical	85.15	16.88	146.37	6.71
Psychological	27.63	6.00	39.91	0.54
Social	51.95	9.20	68.19	5.76
Economic	76.97	15.62	119.32	2.78
Total value of QoL	241.44	30.61	373.79	10.01

**Table 4.** The average difference in QoL value, before and after dental filling treatment and permanent tooth extraction by the respondents

Aspect	Difference value of QoL			
	Dental filling		Tooth extraction	
	Average	Standard Deviation	Average	Standard Deviation
Physical	48.96	16.83	61.21	18.36
Psychological	10.86	6.14	12.27	5.85
Social	26.35	13.06	16.24	8.84
Economic	35.07	17.65	42.35	16.11
Total value of QoL	121.25	35.18	132.36	31.23

**Table 5.** Cost effectiveness ratio (CER) value of dental filling treatment and permanent tooth extraction by the respondents

Treatment	n	Variable		
		Total cost (Rupiah)	Total the differences value of QoL	CER
Dental filling	31	865,967.95	3,759.02	230.37
Tooth extraction	38	851,459.62	5,019.41	169.63

Tooth extraction is more cost effective when compared with dental filling treatment.

## DISCUSSION

Through observation of patient characteristics, it was found that through gender, most patients who receive tooth extraction and dental filling treatment are female. Dental filling treatment and tooth extraction is performed mostly to patients with age between 26–35 years. In observation of job characteristics of dental filling treatment and tooth extraction, which most have a job as employees. Condition of dental caries is found in dental filling treatment and tooth extraction, most of the condition obtained a large caries. The condition of large caries can be associated with understanding of the caries process and its implications for treatment stages who impact less in the public perception

because the caries process itself is running without causing serious symptoms in general health, so that then raises the idea to delay and perform treatment until they feel sick or interfere in a condition of caries that involve most of the tooth.<sup>2,9,10</sup>

In this research, the results of measuring QoL that has a higher value on the measurement after treatment compared with the measurement of time before getting treatment. This applies to both types of treatment, namely dental filling treatment and permanent tooth extraction, in an increase also in the four aspects of QoL analysis, but the difference value of QoL on dental filling is smaller when compared with QoL value on tooth extraction. Increasing the value of quality of life that occurred on both types of treatment is to give an analysis, that dental filling treatment and tooth extraction in Balongsari Public Health Center produce positive impacts on solving problems of patients attending dental health.

Quality of life has a purpose in an effort to bring the assessment of health care. Viewpoint of clinical conditions, quality of life has become subject in connection with the use of instruments that measure health-related condition of patient satisfaction and physiological benefits. Total concept of human health combines both physical and mental factors.<sup>10,11</sup>

Efforts to improve the quality of dental treatment need to pay attention to the characteristics of the patient-related conditions that use to conform to the approach to be used by the health center to raise public awareness about dental caries and the implications for dental treatment stages. Result analysis of the characteristics of obtained treatment, showed that there is a link, providing information those efforts to increase dental filling treatment not limited to activities involving women and children, but also employees in the industrial environment.<sup>10-12</sup>

The difference value of QoL on dental filling is smaller than QoL value on tooth extraction. That is probably associated with the process of dental filling treatment which consists of several stages, with adjustments to the state of dental caries activity. This can be caused by active caries process then filling or cavity cleanup before dental filling process that has not reached an optimal cleaning, so caries activity is still possible to occur. In the treatment of tooth extraction, more minimal post-treatment problems occur because vital tooth extraction was performed or not in gangrene state, so the likelihood of infection is lower, with lower level of difficulty in the removal process against the low possibility of post-treatment problems of tooth extraction.<sup>9,13</sup>

In this research, the results of calculating the cost-effectiveness ratio are lower in the permanent tooth extraction compared with dental filling treatment. That is related to the higher amount of the total cost and the smaller difference value of QoL when compared with the number of total costs and excess QoL value in the treatment of permanent tooth extraction. Process of dental filling treatment and permanent tooth extraction consists

of several steps that must be passed in accordance with the theory of applied dentistry, which aims to achieve treatment success, such as to eliminate the potency for secondary caries in dental filling, preventing damage of dental filling, the occurrence of infection and excessive bleeding on tooth extraction scar. Small size and the location of tooth, create the potential barriers related to internal factors associated with patient conditions, and external factors that can reduce effectiveness of treatment results, including resource constraints factor, related to the ability of the service, completeness of equipment and facilities, the quality and ability of the materials used, and the sterility of the dental treatment process factor.<sup>14,15</sup>

Psychological factors which are formed from the impact of quality of life, and it can potentially influence the selection of types and care to do next. Consideration of the analytical quality of life experienced by a person giving a strong influence, it can be a solid basis for decisions affecting assessment and relatives in his neighborhood. Dental health care carried out on the basis of eliminating pathological impact, regardless of the impact of quality of life of patients on treatment, then it affects the patient's quality of life, it will create a negative analysis or dissatisfaction in the completion of dental problems they have experienced.<sup>16</sup>

Discussion of the quality of life and cost effectiveness becomes increasingly important for health topic related costs and values complexity of the relationship of health care services are obtained. Health care providers are expected to make economic policy as an intermediary that connects between the health care needs.<sup>16,17</sup>

Quality of life that describes the patient groups or regions is also relevant in the assessment of population health needs. Conventional health indicators did not include analysis about the state of healthy or distortion by the clinical demand and supply factors. Evaluation of effectiveness and assessment of health needs are often necessary to cut the program area and an extensive treatment is associated with the allocation of resources.<sup>4,16</sup>

It is concluded that the total costs incurred by patients to obtain filling treatment are higher than tooth extraction. Differences of QoL values in filling treatment are lower than the extraction. Cost effectiveness ratio in the filling treatment is higher than the extraction, that the tooth extraction treatment is considered more cost effective than filling treatment.

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