Digital Application for Early Detection of Children's Quality of Life Related to Dental Caries Risk Based on Website

Wiworo Haryani[1]*, Irma HY Siregar[2], Tedi Purnama[3]

1. Department of Dental Health, Poltekkes Kemenkes Yogyakarta, Indonesia.
2. Department of Dental Health, Poltekkes Kemenkes Semarang, Indonesia.
3. Department of Dental Health, Poltekkes Kemenkes Jakarta I, Indonesia.

Abstract

Dental caries will have an impact on the quality of life of children. The lower the dental caries index, the higher the quality of life of the child. The purpose of the study was to design a digital application for early detection of children's quality of life related to the risk of dental caries based on a website. This type of research is analytic observational. The research sample was 200 elementary school children aged 8-11 years. The sampling technique was purposive sampling. The research was conducted in 3 (three) stages, namely the requirements definition stage, system and database design, implementation and analysis. The system and database design stage is based on several risk factors for dental caries, in order to obtain the following algorithmic equation: Quality of life $(Y) = -4,405 + 1,074X1 + 1,144X2 + 0,918X3 + 0,884X4 + 1,116X5$. This research has produced a digital application design for early detection of children's quality of life related to dental caries based on a website Early Detection of Life Quality Based on Caries (DLQC).

Introduction

Dental caries is a major problem in the oral cavity of children. Based on basic health research data in 2018 the percentage of children aged 10-14 years in Indonesia who experience dental and oral caries is 73.4%. Children aged 8 to 11 years are a group that is vulnerable to dental and oral diseases because generally children are still have behaviors or self-habits that are less supportive of dental health.[1–4]

The high incidence of dental caries requires optimal treatment, especially in the prevention of dental caries in children. Dental caries if not treated can cause pain and even tooth infection. When this happens in children, it can cause masticatory disorders so that nutritional intake is reduced, body weight decreases, as a result the child's growth and development so that the quality of life is not optimal.[5,6]

Measurement of quality of life in children provides information on individual care needs, provides information to assess oral complaints, functional complaints, emotions, and social welfare related to children's health.[7] Several instruments to measure quality of life related to dental and oral conditions in the form of questionnaires include The Child Perceptions Questionnaire (CPQ) and Early Childhood Oral Health Impact Scale (ECOHIS).[1,8,9] Until now there has been no digital application as an instrument to measure the quality of life related to the risk of dental caries.

One of the ways that can be used to make a promotive and preventive effort for children's dental health successful is the role of a dental hygienist/dentist nurse in strengthening children's perceptions of the benefits of dental and oral nursing care.[10] Preventive efforts should be started early, especially in high-risk children to reduce the increased incidence of new caries and caries severity.[11] The phase of children aged 8-12 years is a strategic phase to develop children's habits to always maintain health from an early age through health promotion programs.[4]

Corresponding author:
Wiworo Haryani,
Department of Dental Health
Poltekkes Kemenkes Yogyakarta, Indonesia.
E-mail: wiworoharyani67@yahoo.com

A preliminary study at SDN Tegalyoso Gamping, Sleman in January 2021 showed that the prevalence of dental caries in elementary school children was still high with a DMF-T index of 4.6, which means that each child on average has 5 carious teeth. The lower the dental caries index, the higher the child's quality of life.[12] Digital applications for early detection of quality of life related to dental caries were developed to make it easier for dental hygienists/dental nurses to carry out preventive promotive efforts related to caries risk which in turn will have an impact on children's quality of life. This application is user-friendly, which is easy to operate, practical, and can be used anywhere and anytime, to access it requires an internet network, and compatible devices and has a web browser installed.

Materials and methods

This type of research is an observational analytic study with a cross sectional design. This study did not manipulate the variables but by looking at the reality directly from the respondents, namely the risk factors for dental caries and the dimensions of quality of life. This research was conducted at SDN Tegalyoso and SDN Kanoman, Gamping District, Sleman Regency, Yogyakarta from March 2021 to November 2021. The research sample was elementary school children aged 8-11 years. The inclusion criteria are as follows; 1) Children aged 8-11 years, 2) Children are in good physical and mental health, 3) Willing to be involved in research by signing informed consent. Exclusion criteria consist of; 1) The child is sick, 2) The child is not present when the research is carried out.

The sampling technique was carried out by purposive sampling.15 The results of data collection at the location obtained a number of 200 elementary school children. The research data were analyzed univariably descriptively to calculate the description of the risk factors for dental caries and the dimensions of quality of life, proportion and mean + SD. Multivariable analysis data were analyzed by logistic regression.

Results

Research on designing digital applications of dental caries risk factors and dimensions of children's quality of life was conducted at SDN

Tegalyoso and SDN Kanoman, Gamping, Sleman, Yogyakarta on 200 children. Data collection was carried out to identify risk factors for dental caries that contribute to children's quality of life with the following results:

Characteristics of respondents	n	%
Age		
8 years	10	5.0
9 years	91	45.5
10 years	89	44.5
11 years	10	5.0
Gender	90	45.0
Male	110	55.0
Female		
Mother's education		
Primary school	16	8.0
Junior high school	47	23.5
Senior high school	96	48.0
College	41	20.5
Caries experience		
Yes	152	76.0
No	48	24.0
Teeth condition		
Crowded	99	49.5
Not crowded	101	50.5

Table 1. Frequency distribution of respondent characteristics.

Table 1 shows that most of the respondents are 9 years old (45.5%), female 110 children (55.0%), high school mother education is 96 people (48%), children who have caries experience are 152 children (76 ,0%) and the condition of the teeth were not crowded as many as 101 children (50.5%).

The results of the multivariate analysis using the enter method of logistic regression to design digital applications are as follows:

	B	S.E.	Wald	df	p	OR	95% C.I for EXP(B) Lower	Upper
Dental caries	1.074	0.371	8.373	1	0.004	2.928	1.414	6.063
Mother's education	1.144	0.402	8.076	1	0.004	3.138	1.426	6.905
Knowledge	0.918	0.374	6.013	1	0.014	2.503	1.202	5.213
Tooth brushing behavior	0.884	0.354	6.244	1	0.012	2.421	1.210	4.842
Eating habit	1.116	0.353	9.993	1	0.002	3.053	1.528	6.099
Constant	-4.405	0.767	32.978	1	0.000	0.012		

Table 2. Risk factors for dental caries on children's quality of life.

Table 2 results of the multivariate analysis showed that the experience of dental caries, mother's education, knowledge of dental

caries, tooth brushing behavior, and eating habits of cariogenic foods significantly affected the quality of life (p<0.05).

Discussion

The results of the study of risk factors for dental caries on children's quality of life were influenced by dental caries experience, mother's education, knowledge of dental caries, tooth brushing behavior and eating habits of cariogenic foods. The higher the dental and oral health problems of children, the lower the quality of life of children. This is in accordance with research that proves that the status of dental caries is related to the quality of life of children.[13,14]

Knowledge, attitudes, and good actions about dental health affect the behavior of maintaining dental and oral health in children. Lack of dental health knowledge can lead to an attitude of not caring about dental and oral hygiene. The level of knowledge is one of the main things that causes the high incidence of caries.[15,16]

In this study, most of the children answered correctly on the questionnaire about the causes of caries, due to cavities, and the importance of dental caries treatment, this is in line with the opinion that there is a significant relationship between knowledge and dental caries status of children. The better the child's level of knowledge, the lower the child's dental caries.[17,18]

One indicator to measure a child's quality of life is by looking at the frequency of tooth brushing. The frequency of tooth brushing is related to the incidence of dental caries, although other studies have shown that a person's experience of dental caries is more influential on cases of dental caries. The behavior of brushing teeth using toothpaste containing fluoride can prevent dental caries and periodontitis.[10,19,20]

The eating habits of elementary school children that are often encountered are consuming cariogenic foods such as snacks available at school this can affect the child's appetite so that the child is malnourished.[21,22] Consumption of sugar by children such as drinking and eating sweet foods more than once a week there is a significant relationship with the dental caries index of children.[23] The frequency of consuming sweet foods or fast food has a

significant relationship with the dental caries index (DMFT) and children's quality of life.[20] Dental caries that is not treated can reduce productivity in children, which can indirectly affect the quality of life.[13]

The algorithm equation formed from the results of the multivariate test for designing digital applications is: Quality of life

$$(Y) = -4.405+1.074X_1+1.144X_2+0.918X_3+0.884X_4+1.116X_5$$

Information:

X_1 : Experience of dental caries,

X_2 : Mother's Education,

X_3 : Knowledge about dental caries,

X_4 : The behavior of brushing teeth,

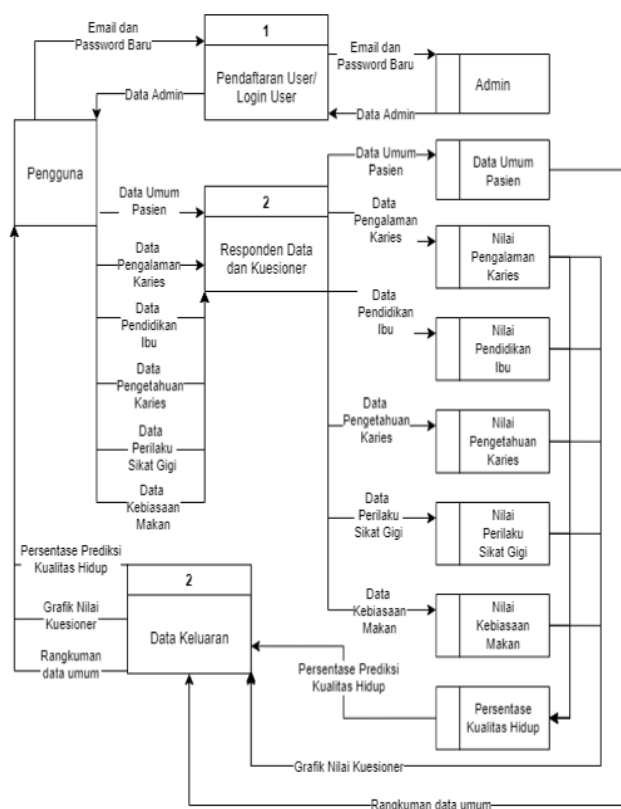X_5 : The habit of eating cariogenic food

Figure 1. System Design Diagram.

This type of application website is a dynamic website with input data that is processed into output data. The initial trial of this application website uses free web hosting, namely firebase. This application website has a simple appearance, using the Hypertext Markup Language or HTML programming language to create the page, Cascading Style Sheets or CSS

to modify the appearance so that it is more structured and uniform, and Javascript to perform authentication and function creation.

The appearance of the application website for early detection of quality of life in children related to the risk of dental caries is as follows:
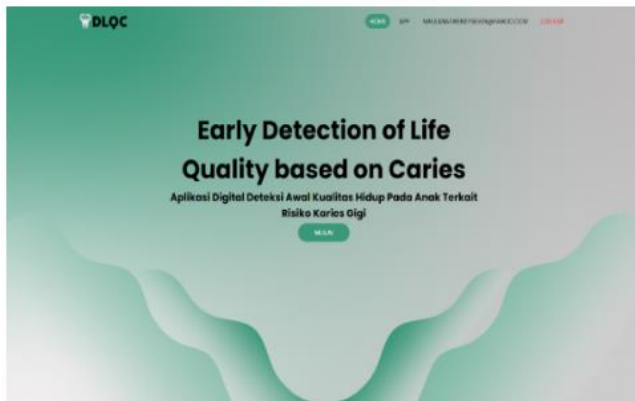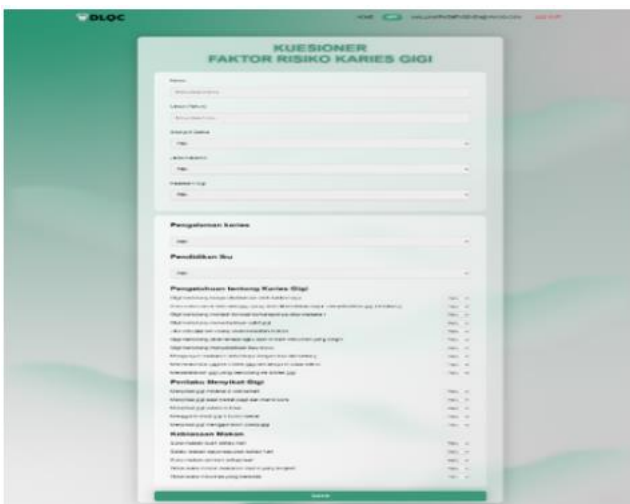

Figure 2. Main Page.

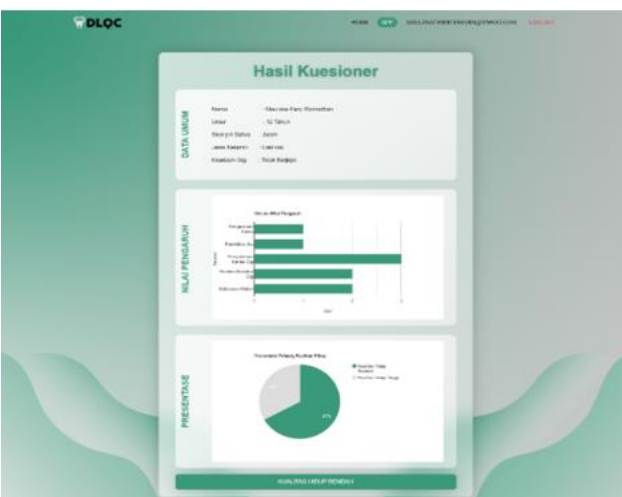**Figure 3.** Questionnaire page.

Figure 4. Results Page.

Conclusions

Based on the results of the study, it can be concluded:

Risk factors that influence the quality of life of children are dental caries experience, mother's education, knowledge about dental caries, tooth brushing behavior, and eating habits of cariogenic foods.

The finding of the algorithm equation for designing a website-based digital application, namely:

$$(Y) = -4.405 + 1.074X_1 + 1.144X_2 + 0.918X_3 + 0.884X_4 + 1.116X_5$$

The creation of a digital application website for early detection of children's quality of life related to the risk of dental caries, namely Early Detection of Life Quality based on Caries (DLQC).

Ethical Clearance

The study was conducted after obtaining approval from the Ethics Committee of the Health Polytechnic of the Ministry of Health Yogyakarta No.e-KEPK/POLKESYO/0321/III/2021

Declaration of Interest

The authors report no conflict of interest.

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