



Parental Knowledge Regarding Dental Radiography of Children Attending Dental Clinics in Ilam, Iran

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Abstract

Background: Radiological examinations expose the patient to the adverse effects of ionizing radiation, which is more severe among developing children. This can cause excessive and unreasonable fear and anxiety for parents and even disrupt the treatment process. This study aimed to evaluate the parents' knowledge about dental radiographs for children referred to dentistry, and to assess the relevant factors.

Methods: The present study is a cross-sectional analytical study examining parents of children referred to dental clinics from October 2019 to April 2020. The required information included demographic information, and nine statements for assessing parents' level of knowledge. One-way analysis of variance (ANOVA), independent t-test, and linear regression were used to analyze the data. Ward's cluster analysis method with a squared Euclidean distance was adopted to include the background and demographic variables.

Results: A total of 108 parents of children referred to Ilam dental clinics – including 69 females (68.3%) and 32 males (31.7%) in the 24-51 age range, participated in this study. Among the studied variables, the level of educational attainment of the parents had a highly significant influence ($P < 0.01$) on their knowledge of pediatric radiography. Furthermore, parents holding bachelor's degrees or higher with an average score of 5.35 had more heightened awareness of radiography than those in other educational groups.

Conclusions: Examining the parental radiographic knowledge revealed significant differences among three groups of parents with educational attainment in favor of those with higher educational achievement. In general, three biographical variables, namely age, gender, and household size were found to be less influential. Therefore, the dentists should learn about the educational attainment of the parents and provide them with the required information on treatment accordingly. Due to the relatively poor knowledge of the parents about children's dental radiographs, it is recommended that plans be developed for raising the parental awareness of the issue in order for reducing their unreasonable fears which may create a burden for dental treatment procedures.

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Background

Generally, dental X-ray imaging plays a significant role (statistically 32%) in the total X-ray-based examinations on human subjects. However, research based on the data from European countries have demonstrated that this type of imaging possesses a low average effective dose, which contributes to the collective and effective dose an amount as low as an estimated 2%–4% of the whole pooled effective doses for plain radiography (1).

Ionizing radiation can induce genotoxicity, carcinogenesis, and cytotoxicity in human tissues (2). Ionizing radiations such as X-rays have sufficiently high energy to penetrate the living tissues from considerable distances and, therefore, are useful for medical diagnosis. Although X-ray-based imaging techniques are critically acclaimed by professionals and widely used for diagnostic

Highlights

- ▶ Effect of higher education on radiographic knowledge of parents
- ▶ Non-significant association between age and gender of parents and their knowledge regarding dental radiography of children

and therapeutic purposes, they have the burden of potentially harmful effects related to radiation exposure on human. Paradoxically, the implementation of x-rays, which may cause some damage to genomic DNA and further induce carcinogenesis and mutagenesis (3), has posed a dilemma where the families are left to choose a suitable alternative from among some risky alternatives. Children are likely at higher risk and more vulnerable to genetic damage induced by radiation exposure compared to adults as well as the young, since the fast-growing

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tissues are more sensitive than the mature tissues (4).

The above-mentioned risk factors associated with radiography, however, are only one side of the problem; the other side is the defectiveness of the pediatric dental practice when giving diagnosis and prescribing treatment without implementing the radiographic techniques (5,6). Nowadays, two-dimensional techniques like occlusal, bite-wing (BW), periapical, panoramic, and cephalometric radiographs are primary and conventional diagnostic imaging techniques employed in pediatric dentistry. However, the multislice computed tomography, radioisotope imaging (nuclear medicine), contrast studies, as well as ultrasound and magnetic resonance imaging (MRI) have made small contributions to the daily dental practice (7). Among the given techniques, imaging, ultrasound, and MRI do not emit ionizing radiation and, hence, have no negative impacts on human health and can address safety concerns over radiation protection.

Dental cone beam computed tomography (CBCT) devices supply high-resolution tomographic images that have been increasingly used in oral and maxillofacial radiology during the past decades. Though CBCT is a frequent choice in many clinical conditions at all ages – including childhood and adolescence (8), the effective dose in children exposed to CBCT could be greater than conventional radiographs (9,10).

The radiographs are most frequently used in pediatric dentistry for detecting caries, assessing tooth development and eruption level, evaluating the situation of dental injury, diagnosing pathological status and changes, and so on (11). Nonetheless, the underestimation of dental caries – particularly of those with occlusal and proximal surfaces estimated in environmentally-controlled clinics, usually occurs when the diagnostic procedure is not aided by additional radiography (12). Dental caries is the most common chronic childhood disorder arising negative consequences for children's confidence, as well as their eating and sleeping behaviors (13).

Although numerous researchers have been carried out to examine the causal relations concerning radiation hazards (14-17) and the relevant patients' perception and knowledge (18-20), parental perception and awareness of the dental radiography in children still remains limited and inadequate (21). Boutis et al (18) argue that most of parents are willing to receive advice about potential malignancy risks before scheduling for image acquisitions. Chiri et al (21), on the other hand, believe that the majority of the parents have an optimistic view about the dental radiographs of their children. Therefore, there is quite insufficient information on whether or not the essential parenting variables play critical role in strengthening the incentives in decision-making processes. Furthermore, whether these variables can be shown to relate to parental radiographic knowledge (22).

This study aimed to evaluate the parents' knowledge

and perceptions about radiography when they faced a situation in which the dental radiography was prescribed for their children, as well as to examine other relevant factors.

Methods

Study Population

A cross-sectional and questionnaire-based survey was carried out during the period of October 2019 to April 2020. Face-to-face interviews and questionnaires were conducted and used in this study. Our questionnaires were similar to those developed by of Chiri et al (21) at the University of Western Australia. The parental questionnaire was intended to elicit information on family background, demographic knowledge, and dental experiences of the parents. The program was targeted primarily to the public and private dental clinics in Ilam, Iran. The parents of 4-12 years-old children – particularly the less-educated parents, were given the survey and were asked to fill it out.

Parents unwilling to cooperate or those with prior background information about radiology and dentistry due to their job positions were excluded from the study. A cover letter outlining the objectives of the research was also attached to each questionnaire. Moreover, in order for protecting the confidentiality of the participants, they were given codes and were informed about it before completing the questionnaires. A total of 108 questionnaires were collected.

Questionnaire

The questionnaire included 19 items intending to elicit information on two factors: ten questions for eliciting demographic information (i.e., age, gender, level of highest education, number of children, age of the eldest child, frequency of parent's and child's dental visits, whether the parents had accompanied their child to the dentist, attendance at private or public dental centers, and if the child had already experienced dental diagnostic radiography) and nine statements for assessing parents level of knowledge. The nine statements were intended to have parents choose between correctly, incorrectly, or "I don't know". For incorrect answers the score of "-1", for correct answers the score of "1", and for "I do now know" answers the score of "0" were recorded.

Statistical Methods

The assumption of distribution normality was tested using the Shapiro-Wilk normality test before carrying out statistical analysis. Arcsin \sqrt{x} transformation of the data was performed to normalize the distribution. Prior to data transformation, 0 was substituted with $(1/4n)$ and 1 with $(1-(1/4n))$, where n is the number of observations (23). The descriptive statistic tests were conducted to examine the demographic and knowledge characteristics. Then,

one-way analysis of variance (ANOVA), independent t-test, and linear regression were adopted for data analysis. Cluster analysis was done based on 101 questionnaires (out of 108), including all background and demographic characteristics using Ward's method with a squared Euclidean distance measure. All tests and calculations were performed using Statistical Package for Social Science 24.0 (SPSS.v.24) software (Chicago, IL, USA).

Results

The data from 108 questionnaires were equally collected in private clinics and public dental clinics in Ilam. After transforming the data, normality of the data was confirmed by the Shapiro-Wilk normality test at a significant level of 5%. The results from the variance analysis revealed a highly significant effect (P value <0.01) of the parents' educational attainment levels on their knowledge of pediatric radiography. Parents having bachelor's degrees or higher with an average score of 5.35 were found to have more heightened awareness about the radiography than those holding primary school (4.0) or secondary school (3.92) diplomas (Figure 1).

There was no significant association between the gender groups (i.e., male and female) and the parental knowledge of pediatric radiography (P value=0.14). The results showed that with an increase in the age, parents' awareness also increased, albeit this increase was statistically insignificant (P value=0.11). The number of children was detected to have no significant effect on the parents' level of knowledge (P value=0.2). According to our study results, the mean score of the knowledge of parents referring to private clinics for treatment was found to be higher than the mean score of those referring to public centers, although the difference was not statistically significant (P value=0.3). Likewise, the average awareness level of parents with a record of dental imaging for their children was higher than those without the record, but the difference was not statistically significant (P value=0.43). In addition, no significant association was discovered between the level of parental awareness and the number of referrals (P value =0.84).

A statement that the parents were most aware of was the one stating that children were more vulnerable to radiation than adults (74.3%); and a statement that they were least aware of, on the other hand, was the one revealing that the radiation from environment was more than the radiation from dental X-rays (26.7%).

The results from the linear regression between education and parental knowledge are presented in Figure 2. The analysis showed a strong relationship between these two variables, though it should be noted that it was a low value of the coefficient of determination (R^2).

The participants were divided into six major groups after doing cluster analysis (Figure 3). Group 1 included the parents with the highest age and education categories,

who were expected to have the most extensive knowledge about the dental radiology of children.

It was also found that 51.5% of the parents believed that the benefits of X-rays outweighed their harms, and 58.4% of them thought that X-rays for other medical imaging (e.g., chest x-rays) were far more harmful than dental X-rays. Furthermore, %56.4 of the parents considered using X-ray shielding during dental radiography as a useless measure. It is noteworthy that about 73.3% of the parents did not have enough knowledge about the dangerous cosmic rays. Only about 26.7% of them considered the risk of their daily exposure to these rays to be higher than the risk of exposure to radiographic rays.

Discussion

This study aimed to evaluate the level of parental awareness about the advantages and disadvantages of pediatric radiography. The results showed that among the studied variables, only educational background had a significant influence on their knowledge of pediatric radiography. These findings were consistent with results from an earlier study by Chiri et al (21), which also showed that the knowledge scores obtained by different educational groups differed significantly. Although their research was the only one similar to our study in terms of study purpose, the parents of children with a radiography records in their research were found to have significantly

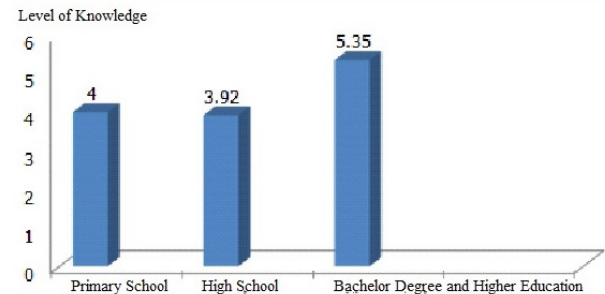


Figure 1. Effects of Parent's Education on Parental Knowledge of Dental Radiology.

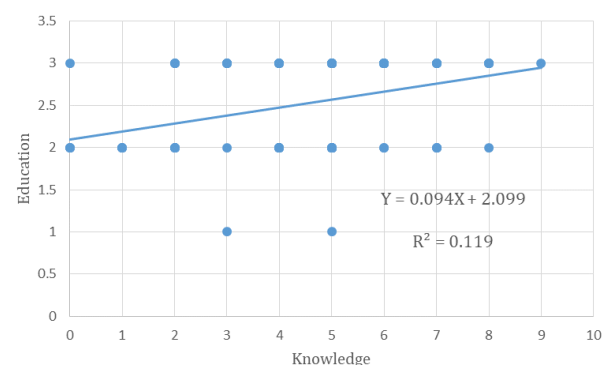


Figure 2. Linear Relationship Between Parental Education and Their Knowledge of Pediatric Radiography .

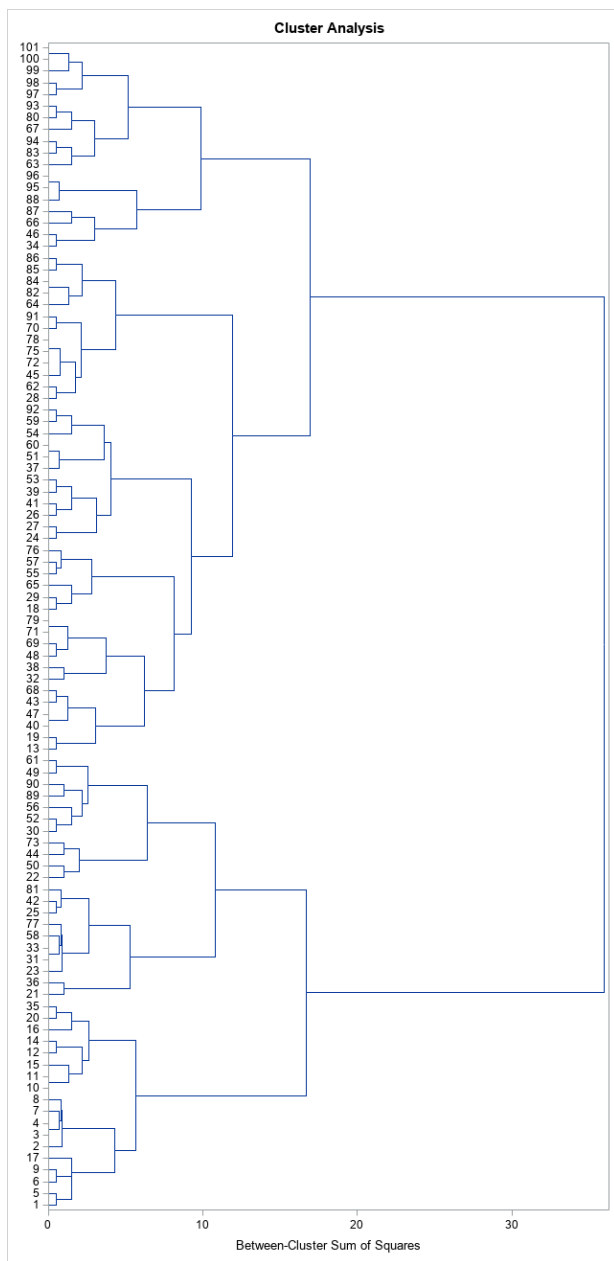


Figure 3. Cluster Analysis of Parental Knowledge About Dental Radiography of Children.

greater awareness of dental radiographs, which was inconsistent with our study results. The discrepancy between the results from two studies could be attributed to the following factors: they sampled different parents' populations and investigated different sets of correlates. In addition, the dentists in our study might have spent less time informing parents about their children's radiographs. According to our study results, the awareness of the parents about pediatric radiography was insufficient. Moreover, majority of the parents answered some questions either incorrectly, or "I do not know", which indicated the lack of parental awareness of the dental radiographs during various dental treatments. Following the descriptive information obtained from the questionnaires, it seemed

that some treatment procedures that were entirely approved by the dentists were still vague and controversial for ordinary parents. Several studies have supported the importance of the public health concerns regarding exposure to medical ionizing radiation. Ludwig et al (24), for instance, have shown that the general public is aware of the harmful effects of the sun, but their knowledge of the impacts of medical radiation is minimal. McNierney-Moore et al (25) also have suggested that people should be informed about radiation, its benefits, as well as its potential risks.

Therefore, it seems necessary to provide the public with education about the daily cosmic rays, the potential risks of ionizing radiation, and the principles of radiation protection when taking radiographs. It is suggested that studies with larger sample sizes should be conducted on people living in different regions.

As for determining the relevant parameters responsible for parents' diversity in their knowledge of pediatric radiography, clustering of the parental population showed that diversity in our samples was driven by six groups of parents. The clustering of the participants showed a clear pattern of grouping based on the parents' age and education, as well as other demographic factors.

Conclusions

The results of the present study showed that parents' age, their gender, number of children, age of the eldest child, and place of receiving dental treatment had no significant relationship with parental knowledge about dental radiographs. However, it was found that the parents' educational background had a significant influence on the level of parental awareness of dental radiography. It was also detected that parents with lower education levels had an optimistic attitude towards dental radiographs more frequently, while their radiographic knowledge was limited. This study highlighted the significance of providing the parents and patients with accurate and objective information about dental radiographs. It is, therefore, recommended that the dentists consider the education level of the parents, as well as decide on the time and amount of explanation required to inform them about dental radiographs. Due to the relatively low knowledge of parents about children's dental radiographs, it is also suggested that plans be developed for raising the parental awareness of the issue in order for reducing their unreasonable fears which may create a burden for dental treatment procedures.

Conflict of Interest Disclosures

The authors declare that they have no conflict of interests.

Ethical Statement

Ethical approval of this study was granted by the Ethical Committee of Ilam University of Medical Sciences (no. 10.02.98.2287).

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