

# GENDER DETERMINATION AMONG CHILDREN USING CAST ANALYSIS OF DECIDUOUS DENTITION: A SYSTEMATIC REVIEW

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## ABSTRACT

**Objectives:** To explore the literature search on cast analysis of deciduous teeth in children for identification of their gender, to describe the validity of cast analysis in gender determination and assess that either a difference exists between the deciduous teeth dimensions among girls and boys.

**Materials and Methods:** Different online databases were used for searching articles in last 12 years, search terms were “gender determination among children using cast analysis”. Only those articles were analyzed for further review which worked on odontometric analysis of deciduous teeth used for gender estimation while we excluded those articles which studied cast analysis on permanent teeth and mixed dentition for gender determination, review articles and case reports.

**Results:** Three cross sectional studies were included in this research article, based on pediatric population. In all studies deciduous teeth cast analysis was performed. One study showed that maxillary central incisors, lateral incisors, molar and mandibular canine exhibit sexual dimorphism. Other study found that primary molars dimensions were significantly different in both genders. Third study concluded that primary teeth dimensions were greater in male than female.

**Conclusion:** This study concluded that primary teeth showed sexual dimorphism, so the primary dentition can be used in forensic investigation for identification of gender in children.

**Key words:** Gender determination, Deciduous dentition, Cast analysis

## INTRODUCTION

Forensic odontology is that specialty of dentistry which deals with the appropriate inspection of dental proofs and appropriate assessment and expression of these findings<sup>1,2</sup>. It requires coordination between various disciplines during dealing with the dental proofs and submitting that particular record to the court for legal opinion<sup>3,4</sup>. The authority of forensic odontology comprises of the assessment of age, gender estimation, reporting of dental wrongdoing, bite mark examination and mainly recognition of humans<sup>5,6</sup>. The primary responsibility of forensic

odontologist is to recognize the unrevealed expired individuals in any natural or unnatural tragedy<sup>7,8</sup>. In instance of multiple injuries to the body, dental recognition plays an important role for identification because of enamel which is hardest tooth structure, it resists climatic changes, dissolution, dehydration and extreme injury<sup>9,10</sup>. Measurement of teeth are economical, rapid and accessible method for recognition of human body in comparison with complicated procedures like DNA and fingerprinting<sup>11,12</sup>. In Pakistan practicing of forensic odontology as a separate department is limited<sup>13</sup>. Maxilla, mandible and teeth are very informative material for forensic investigators<sup>14</sup>. Structural distinction between male and female is known as to be sexual dimorphism<sup>15,16</sup>. Different studies showed that sexual dimorphism happens among communities<sup>17,18</sup>. Gender identification of the

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unknown body narrow down the other investigation possibilities<sup>19</sup>. Majority studies of permanent teeth showed that male teeth are bigger than female teeth while vice versa in few cases, due to changes in environment, nutritional values and genetic makeup<sup>20,21</sup>. If deciduous dentition having the same qualities as a permanent dentition so the identification of gender among children would be easier. The current systemic review aim was to collect literature on gender determination in children by using cast analysis of deciduous dentition. So primary teeth could be the best option for forensic odontologist in identification of gender among children at the time of natural or artificial disasters.

## MATERIALS AND METHODS

In figure 1 the flow sheet diagram showed the systemic review method for data finding. Different online means like PubMed, Research Gate, Google Scholar and other sources were utilized for data collection. Relevant articles title, keywords and MeSH terms were used for searching the data. Only English language articles were considered in this review. Last 12 years articles were considered in this review. About 66 articles were studied focused on gender determination using odontometric analysis. The center of attention in this study was to determine gender in children using deciduous teeth cast analysis.

All articles associated with gender estimation using cast analysis were used for collecting data. Only those articles were analyzed for further review which worked on odontometric analysis of deciduous teeth used for gender estimation. Those articles were excluded which studied cast analysis on permanent teeth and mixed dentition for gender determination, review articles and case reports.

The titles, abstracts followed by full text of downloaded articles were thoroughly analyzed for data extraction. The initial analysis of the selected articles which fulfilled the inclusion criteria was performed, which exhibit the objective, study population, variables and data collection technique. Two independent reviewers reviewed the articles and in case of disagreement then it was sent to the 3rd author. The center of attention of this study was those articles which purely worked on deciduous teeth, using cast models for measurements and sexual dimorphism to find out that primary teeth dimensions are different or same in girls and boys.

## RESULT

Among 66 articles, 45 were screened and only 3 were included as these research articles fulfilled the inclusion criteria which were published in last 12 years. All these studies utilized digital vernier caliper for measurement of study cast models. Variables were different among these studies but main focusing point was using cast analysis of primary teeth for gender determination.

A cross sectional study made by Shankar et al, 2018 on mesiodistal and buccolingual dimensions of all primary teeth, two diagonal dimension, mesio buccal distolingual & distobuccal mesiolingual of 1st and 2nd molar, inter canine width & inter molar width of 1st and 2nd molar. The finding of this study was, buccolingual dimensions of mandibular canine, maxillary central incisor & 2nd molar, mesiodistal dimension of maxillary lateral incisor showed significant sexual dimorphism<sup>22</sup>.

Another cross-sectional study was performed by Eswara et al, 2014 showed that buccolingual dimensions of primary teeth exhibit sexual dimorphism and primary molar dimensions were greater in male as compare to female<sup>23</sup>. A study of Akshara Singh et al, 2017 worked on two dimensions of all primary teeth and concluded that mesiodistal and buccolin-



Fig 1: Diagrammatic representation of selection procedure of research article

gual dimensions mean values of primary teeth were greater in male than female. Crown dimensions of boys are greater than girls<sup>24</sup>.

## DISCUSSION

The first systemic review of gender determination using cast analysis of deciduous teeth is still unexplored and according to our observation this is the first review on particular topic. The aim of this study was to compile the scattered existing research data on this topic. The four included research studies worked on primary teeth among children for finding sexual dimorphism. Different database was used for searching articles on this topic, more than 66 articles were generated. In which 21 research articles worked on radiographic findings of oral structures, 45 articles focused on permanent teeth cast analysis either utilized whole dentition or draw comparison among various teeth and only 4 research articles emphasized on cast analysis of primary teeth.

For measurement of teeth dimensions, direct and indirect techniques could be used<sup>25</sup>. In direct method vernier caliper are used for measurement of teeth inside the oral cavity<sup>26</sup>. While performing indirect technique oral cavity impression was recorded and study models obtained by pouring the impression with dental stone<sup>27,28</sup>. Measurement of tooth crown were done on study models by using digital vernier caliper<sup>29</sup>. Eldosoky et al, 2020 found that permanent and primary 1st molar were not good predictors for gender determination<sup>30</sup>. In 2014 a study was conducted by Eswara et al on primary molars which identified that primary first molar showed sexual dimorphism and male having large dimension of crown as compared to female. The reproducibility of

results was checked by another observer measured the teeth having no idea about the initial recordings. No variation was observed between measurement of two observers<sup>23</sup>. According to a study performed by Akshara Singh et al that sexual dimorphism exists in primary dentition, mesio distal dimensions were greater in male while buccolingual dimension of anterior teeth were bigger in females<sup>24</sup>. Shankar et al, 2018 studied on Indian population observed that mesiodistal dimension of maxillary lateral incisor and buccolingual dimensions of maxillary central incisor, 2nd molar and mandibular canine showed significant difference among male and female<sup>22</sup>. Research studies of different scholars showed that not a single parameter of oral cavity could be used for gender determination

## CONCLUSION

As the variation exists in dentition among different population because of different factors like genes, food, environment, etc. Multiple studies confirmed that primary teeth showed sexual dimorphism to some extent, but particular dimension of primary teeth or other parameter of both arches were still unexplored which can help out forensic odontologist during investigations.

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**Table 1: Explain studies on primary teeth using cast analysis**

Cited reference	Variables	Children(n)	Procedure	Sexual dimorphism
Shankar et al, 2018	Mesiodistal and buccolingual dimension of all primary teeth. MBDL & DBML of 1st and molar. ICW & IMW.	364	Measurement with digital vernier caliper of both arches cast models	Buccolingual dimensions of lower canine, upper central incisor & upper 2nd molar. Mesiodistal dimension of upper lateral incisor show significant difference
Eswara et al, 2014	Mesiodistal and buccolingual dimensions of all primary teeth	100	Measurement with digital vernier caliper of both arches study cast	Primary first molar is significantly larger in male.
Akshara Singh et al, 2017	Mesiodistal and buccolingual dimensions of all primary teeth	500	Measurement with digital vernier caliper of both arches study cast	Boys had larger crown diameters as compare to girls

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