

Correlation of Dermatoglyphics in the Early Diagnosis of Dental Caries in Children in India

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Protocol

Keywords: Dermatoglyphics, Dental Caries, India, Children

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Abstract

Background: Dermatoglyphics defined as the study of the complex skin dermal structures covering hand and foot palmar and plantar surfaces. Upon the whole development of the structures, they are unaffected by the environment. That's why they are considered ideal for individual identification, and to detect congenital defects. Nevertheless, the co-relation of dental caries to dermatoglyphics is still at infancy. Hence, the present research proposal will review the work conducted by various authors on application of dermatoglyphics in dentistry along with the advantages and patterns of dermatoglyphics. This systematic review aimed to synthesize the evidence of the relationship between the dermatoglyphics and dental caries.

Methods: A systematic search of the literature will be done in the ProQuest, SCIENCE DIRECT, Google Scholar, PubMed. All papers published from 1 st January 2010 to 31 st December 2019 on this topic will be searched. PRISMA guidelines will be followed. Eligibility criteria will be informed using the PICOS guidelines. Inclusion and exclusion criteria will be used for search and analyzed for heterogeneity. Risk of bias assessment will be performed using Newcastle-Ottawa adapted for cross-sectional studies and case control studies.

Systematic Review Registration: This study was registered with PROSPERO (CRD42020191996).

Conclusion: Dermatoglyphics is a future aspect of medicine and forensic. The link between fingerprints and dental caries is still in its infancy, but in the upcoming time dermatoglyphic can be considered as the predictor of congenital abnormalities. Dermatoglyphics has shifted from darkness to diagnostic device acceptance. This can be important resource in the future that can forecast person's oral health. Keywords: Dermatoglyphics, Dental Caries, India, Children

Introduction

Dental Caries is the most common non-communicable disease (NCD) and an important public health concern worldwide. The 2017 Global Burden of Disease Report reported that 3.5 billion people around the world suffer from oral diseases, with untreated dental caries is one of the most prominent non-communicable disease (Organization, 2017). Poor oral health leads to debilitating misery for millions of people and raises social financial pressures. Although, the global burden of dental caries that are untreated for primary and permanent teeth has remained relatively unchanged over the past 30 years, because of population growth and ageing, the overall burden of oral conditions on services is likely to continue to increase. The vulnerable and economically disadvantageous in society suffer significantly from oral diseases. The correlation between socio-economic status and prevalence and severity of oral disease is very clear and consistent (Organization, 2017). Moreover, it can be easily prevented through easy and cost-effective measures, whereas treatment is costly and inaccessible in low- and middle-income nations (Watt, 2012). In majority the low-income countries, dental caries goes untreated. Extreme dental caries can adversely affect quality of life. For instance, dental caries can cause eating and

sleeping problems, which can lead to pain and chronic systemic infection at its advanced stages (abscesses) (BaniHani, Deery, Toumba, Munyombwe, & Duggal, 2018). It also affects the growth rate. Furthermore, oral illnesses can affect the effectiveness, social and personal issues of an individual in school and at work. The psychosocial effect of many oral disorders reduces the quality of life substantially (Phantumvanit et al., 2018). Dental caries is a microbial disorder of calcified tissue of the teeth, that are characterised by demineralisation of the inorganic part and destruction of the organic portion of the tooth (Odell, 2017). Although, the aetiology of dental caries is complex and multifactorial, but the question of a possible true genetic predisposition to dental caries has been pictorial in the minds of dental researchers for years (Yildiz, Ermis, Calapoglu, Celik, & Türel, 2016).

Dermatoglyphics is the study of the patterns of dermal ridges on palmar and plantar surfaces of hands and feet. Dermatoglyphic patterns, commonly used in judicial and legal study, may be of use in diagnosing many genetic disorders. Dermatoglyphic is a biological carving in the skin in the form of furrow or fold. In 1926, at the University of Oklahoma, Dr Harold Cummins coined the word Dermatoglyphics (Cummins & Midlo, 1961). Sir Francis Galton later invented a complete scheme with guidelines for fingerprint classification (David, 1971). Many scientists, doctors and other health allied personnel's are using `Dermatoglyphics for the investigation and early diagnosis of various diseases (genetic, congenital, and life style (Bhat, Mukhdoomi, Shah, & Ittoo, 2014; Verbov, 1970). The Down Syndrome, genetic disorder was the first medically accepted disease with dermatoglyphic features that was published in "The Lancet" (Oghenemavwe & Tagar, 2017). After that several other genetic, congenital and lifestyle disorders like Down's syndrome, Alzheimer's disease, multiple sclerosis (Okeke, Etoniru, & Oforbuikem, 2019), diabetes mellitus (Asif, Lahig, & Babu, 2016), been investigated and linked to the basic characteristics of dermatoglyphs. The dental ailments like oral cancer (Odell, 2017), periodontitis (Grace & Sankari, 2019), oral leucoplakia and oral sub mucous fibrosis (Kulkarni, Chaudhari, & Kulkarni, 2020), malocclusion (Avirachan, Ani, & Zachariah, 2019), cleft lip and cleft palate (Neiswanger et al., 2020) have been also associated with dermatoglyphics. Various studies been conducted by health allied personnel to identify the correlation between dermatoglyphic and early diagnosis of genetic disease.

How does Dermatoglyphics correlate with the early diagnosis of dental caries?

Dental caries is an infectious, multifactorial disease with one of the etiological factors being genetic susceptibility. Due to the similarity of environmental and genetic influences between the teeth and the skin during their development, the application of dermatoglyphic patterns to dental diseases such as caries is rationalised. The formation of both dermal ridges and craniofacial structures are during the 6th-7th week of intrauterine life from the same layer (ectoderm) and at the same time of intrauterine life (Bazmi, Sarkar, Kar, Ghosh, & Mubtasum, 2013). Therefore, indicating that the genetic information stored in the genome is dissipated during this time and any disruption affecting the development and structure of the tooth will be reflected simultaneously by changes in dermatoglyphic patterns. Hence, dermatoglyphics could be very useful tool for diagnosing suspected genetic abnormalities as a preliminary investigative process.

Rationale

The evidences mentioned in the literature review can change the perception of the relationship between dermatoglyphics and dental caries. Although, there are many paradoxical proofs, all studies have noted that there is indeed evidence between the two as both are influenced by genetic and environmental determinants. Many investigative approaches have been tried from last few decades to find the relation between dental caries and dermatoglyphics with inconclusive findings. Therefore, the systematic review will be conducted to provide robust evidence regarding the relationship between dermatoglyphics and dental caries in children. So, the data generated from this study will be more reliable and will help policy makers to set standards for the early diagnosis of dental caries with the help of dermatoglyphic patterns.

Objective

The primary objective of this review is to measure the association between early diagnosis of dental caries and the dermatoglyphics in the children in India.

Methods

Design and methods used for this systematic review comply with Centre of Research and Dissemination Guidelines, Meta-analyses of Observational Studies in Epidemiology and is reported in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Eligibility criteria were informed using the PICOS guidelines.

Eligibility Criteria:

Studies will be selected according to the criteria mentioned below

(P) Population: We will include studies which has been done on children.

(I) Interventions: The papers which presents the early diagnosis, prediction, screening of dental caries with dermatoglyphics will be included. The other etiological factors like saliva which have correlation with dental caries and dermatoglyphics will also be included.

(C) Comparisons: In this case, it is not applicable.

(O) Outcomes: The primary outcome measures will be the early diagnosis of dental caries with the help of dermatoglyphics testing.

(S) Setting: India

We will include articles reported in the English language only.

Information Sources

A systematic search of the literature will be conducted in the following databases that is, ProQuest, SCIENCE DIRECT, Google Scholar, PubMed. All papers published from 1st January 2010 to 31st December 2019 on this topic will be searched.

Search Strategy

To find the relevant articles Boolean operator “OR” and “AND” will be used. “OR” will be used to find the articles with more than one search terms and synonyms and “AND” will be used to combine the different concepts. To ensure that different forms of a word and spelling has been included in the search, truncation and wildcards will be utilised. MeSH subheadings will be used and “keywords” where relevant for given databases.

The search terms will include “dermatoglyphics”, “fingerprints”, “biometrics” combined with “dental caries”, “dental cavity”, “tooth caries”, “tooth cavity” combined with “early diagnosis”, “prediction”, “prevention”, screening. The table shown below includes the important keywords which will use to identify the PICO that is, population, the intervention, its outcome and to appraise the other factors of the search. The search plan table helps us to narrow the important concepts and keywords and to exclude the points which can cause errors in the search.

CREATING A SEARCH PLAN: Search plan table is shown below:

	Concept 1	and →	Concept 2	and →	Concept 3	and →	Concept 4
List all key words/terms as stated in your topic description above	Dermatoglyphics		Dental caries		Early Diagnosis		Children
	OR ↓		OR ↓		OR ↓		OR ↓
List search terms using truncation* and wildcards?	Dermatoglyphic*		Dental* Caries*		Early* Diagnosis*		Child*
	OR ↓		OR ↓		OR ↓		OR ↓
List synonyms, alternate spelling, language, etc.	Fingerprints Biometrics		Tooth caries Tooth cavity Dental decay Dental cavity		Identification Discovery Detection Screening		Kids Child Toddler Preschool

Study Records

Data management

We will implement the search strategies and import all the identified references into endnote. The search results will be compiled in a single endnote library from the various bibliographic database's and endnote will exclude duplicate based on journal and title etc.

Selection process

Information sources will be searched independently by three reviewers (VD, KJ and JB) and identified studies will be assessed for inclusion by grading each eligibility criterion (Van Tulder et al, 2003). After removing duplicates, we will have two screenings: first screening based on titles and abstract only and will remove the irrelevant articles with reasons) and second screening based on full text articles and remove the irrelevant articles with reasons. The remaining articles after these two screenings should be then full text reviewed for data extraction (CRD, 2009). Firstly, all three reviewers will assess the study

independently and it will be included after they feel study satisfy the inclusion criteria from full text. The other reviewer (DM and ST) will read the study in case of any disagreement between both reviewers (Furlan et al, 2009).

Data extraction process

Once the studies have been selected for inclusion, a standardised form will be used to extract the data and three reviewers (VD, KJ and JB) will extract the data independently. In the case where full article has been not available on the database or the library services, it will be search through google scholar or will contact the corresponding author via email to provide the article. In case of no reply from the author, that article will be excluded from the review and reasons will be recorded and reported in the review. The other two reviewers will independently check the data for consistency and clarity. Any disagreements between the reviewers during this stage of the study will be resolved through discussion with the other two reviewers. The results of the search will be reported in and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram.

Data items

The extracted data will include specific details about the articles that is journal name, publication year, author details, study methodology, study population and participants demographics (Indian States) and characteristics, sample size, sampling technique, details of the exposure (dental caries), outcomes (diagnosis of dental caries), assessment tools (dermatoglyphics).

Risk of bias in individual studies

The probability of bias for each trial included will be measured separately by the same initial reviewers and in case of conflict the other two reviewer will mediate. The consensus between the reviewers will be included in Cohens evaluation. The chance of bias will be measured on the scale of Newcastle Ottawa (Deeks et al., 2003).

Synthesis

Data will be summarised and presented in tables and figures and then data will be analysed.

Confidence in cumulative evidence

The strength of the overall body of evidence will be assessed using Grading of Recommendations, Assessment, Development and Evaluation (GRADE).

Abbreviations

NCD: Non-Communicable Diseases

PICOS: P – Patient, Problem or Population. I – Intervention. C – Comparison, control or comparator. O – Outcome(s)

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

KJ: Kritika Jain

VD: Vibhor Dudhraj

DM: Debraj Mukhopadhyay

JB: Jasdeep Boparai

ST: Sandhya Tathireddy

BSc.: Bachelor's in Science

MPH: Master of Public Health

MPHA: Master of Public Health (Advanced)

Declarations

Amendments

Relevant changes to the protocol shall be reported and disseminated after registration.

Support

This study was not provided with any source of funding. The three authors are the MPH students at Torrens University, Sydney and other two are the MPH students at Delhi Pharmaceutical Sciences and Research University, New Delhi, India.

Ethical Approval and consent to participate: Not Applicable

Consent for publication: Not Applicable

Availability of supporting data: Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

Competing interests: We wish to confirm that there are no known conflicts of interest associated with this publication.

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Authors' contributions: KJ, VD, and ST did the literature review and DM and ST drafted the manuscript. KJ and JB took the lead in writing the research proposal.

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Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [APPENDIX.docx](#)
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