Does Dermatoglyphics An Essential Tool for Predicting Dental Caries? - A Systematic Review

Suganya P[1], Lubna Fathima[1], Prabu D[2], Raj Mohan[3], Bharathwaj[4], M.R. Prashanthy[1]

[1]Post Graduate Student (MDS), [2]Professor, [3]Reader, [4]Lecturer, Department of Public Health Dentistry, SRM dental college, Ramapuram, Chennai, India

Abstract

Background: Dermatoglyphics is one the vital tool which helps to predict many systemic diseases including oral problems. Dental caries seems to be a major problem overall the globe. The best way to manage this condition is only early diagnosis.

Aim: This study aims to assess whether dermatoglyphics effective in predicting dental caries.

Materials and Method: A systematic review of controlled trials was performed. The data were hand searched using electronic databases and the 328 number of articles were screened. The intervention and outcomes were assessed in the study included for systematic review. The bias assessment of the articles was done by using Newcastle Ottowa scale.

Results: Seventeen cross-sectional studies were included in our systematic reviews. Of that sixteen articles were found to be statistically significant, but further studies should be done in other countries to prove the association between dermatoglyphic pattern and dental caries.

Conclusion: The pattern of dermatoglyphics was found to be very effective in predicting dental caries and thereby prevent the caries formation at an incipient stage.

Key Words: *Dermatoglyphics, Finger print, Dental caries, Streptococcus mutans.*

Introduction

Dermatoglyphics or palmistry is the study of the permanent dermal ridges of the hand and feet. The term dermatoglyphics is procured from Greek word which means skin carving. It is the pattern of imprints of the epidermal ridges of the plantar and palmer surfaces of both feet and hands. In simple term, it is considered as the study of finger prints. The finger print of human beings always remains unique throughout their life time and it will not change. It is a very essential tool for the preliminary investigations such as the cases with suspected or doubtful genetic basis [1,2]

In the recent times, the dermatoglyphics plays a crucial role in determining the future incidences of mystery to a perfect application on a scientific basis. The use of dermatoglyphics not only helps in the identifying the person based on the genes, it also plays a vital role in predicting many systemic diseases in both medical and dental aspect. Hence it is very useful for the health care professionals in detecting the diseases at an earlier stage [3].

The dermatoglyphics have been correlated with many systemic diseases due to the coexistence in the morphology of organogenesis and the structure of dermatoglyphics by their interlinked genetic countenance. The dermatoglyphics study is based on the finger ridges which was under the jurisdiction of genetic and environmental factors; hence they act as a reservoir of the early genetic and developmental anomalies [2,3].

Currently, the dermatoglyphics have been used to predict many oral diseases such as precancerous lesions, oral clefts, dental caries and many other conditions. Of these dental caries is one of the most predominant disease that exists globally and affects all age groups in

general. Though many recent advanced materials and technologies have development to determine and treat dental caries but the problem still persists [2].

Dermatoglyphic pattern is considered as a genetic marker to predict dental caries due to the similarity in the ectodermal origin of the epithelium of finger buds, enamel and the primary palate which was development during the same intrauterine period [3].

Various studies have been conducted regarding the association of dermatoglyphic patterns and dental caries. To clarify this in an appropriate manner, this present study aims to evaluate the association of dermatoglyphics and dental caries by conducting a systematic review.

Materials and Methods

In this study the systematic review of trials was carried out to evaluate the association between dermatoglyphic pattern and dental caries.

SEARCH STRATEGY: The articles related to the correlation between dermatoglyphics and dental caries were hand searched using electronic databases such as Prospero, Web of science, Cochrane library, Wiley online library, Grey literature, Science direct and PubMed. The articles were retrieved from each database based on the mesh representation.

INCLUSION CRITERIA:

Original articles

Articles with full text are included

Only cross sectional studies

In vivo studies

Only articles with correlation of dental caries and dermatoglyphics are included

EXCLUSION CRITERIA:

Articles other than English language

Review articles, case control

In vitro and animal studies are excluded.

Search engine:

Cochrane library

Wiley online library

Prospero

Pubmed

Science direct

Grey literature

Web of science

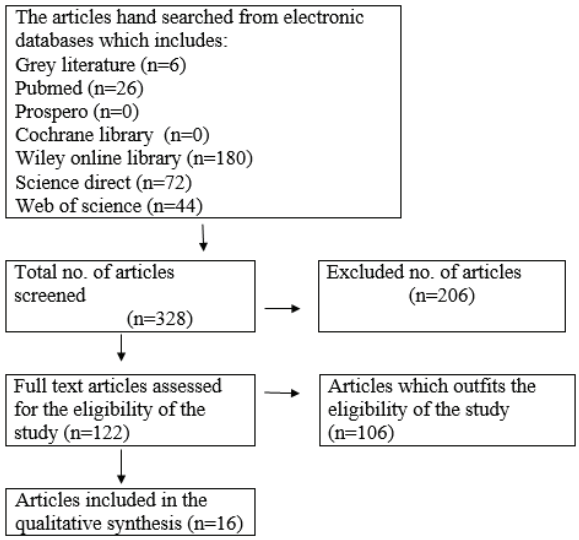

TABLE 1: Intervention of the studies based on the association of dental caries and dermatoglyphics

Author Name	Year	Place	Study Design	Patient Age	Origin Of Subjects
Bazmi et al [4]	2013	India	Cross sectional study	4-14 years	Study group: with dental caries Control group: without dental caries
Thakkar et al [5]	2014	India	Cross sectional study	12 years	Group 1- DMFT score 0 Group 2- DMFT score 1-3 Group 3- DMFT score >3
Kochhar et al [6]	2014	India	Cross sectional study	12-14 years	CARIES ASSESSMENT: GROUP 1: DMFT/ dmft <3 Group 2- DMFT/dmft 3-6 Group 3- DMFT/ dmft>6 GINGIVAL AND PERIODONTAL ASSESSMENT GROUP A: OHI-S: 0-1.2 GROUP B: OHI -S: 1.3-3 GROUP C: OHI -S: 3.1-6
Agravat et al [7]	2014	India	Cross sectional study	5-12 years	Study groups: children with dental caries Control group: caries free children
Vijender et al [8]	2015	India	Cross sectional study	5-12 years	Study group: DMFT >5 Control group: DMFT=0
Sanghani et al [9]	2016	India	Cross sectional study	6-13 years	Study group: caries active Control group: caries free
Deepti et al [10]	2016	India	Cross sectional study	6-12 years	Hand prints of subjects were recorded
Saxena et al [11]	2016	India	Cross sectional study	12-15 years	Group 1- DMFT=0 Group 2- DMFT 1-0 Group 3- DMFT > 3
Singh et al [12]	2016	India	Cross sectional study	2-6 years	Group 1- dmft score 0-2 Group 2- dmft score 3-4 Group 3- dmft score > 5

Maroli et al [13]	2016	India	Cross sectional study	5-12 years	Group 1- caries free male children with DMFT score=0 Group 2- caries free female children with DMFT score=0 Group 3- caries active male children with DMFT score >5 Group 4- Cries active female children with DMFT score >5
Elkwatehy et al [14]	2016	Egypt	Cross sectional study	3-6 years	Study group- caries active children with dmft = 4 Control group- caries free children
Kaur et al [15]	2018	India	Cross sectional study	6-12 years	Group 1: subjects with presence of ≥4 dental caries teeth Group 2: subjects with no dental caries
Reddy et al [16]	2018	India	Cross sectional study	6-16 years	Study group: Group A- visually impaired with equal number of with and without dental caries Group B- deaf and mute children with equal number of with and without dental caries Group C- mentally disabled children with equal number of with and without dental caries Control group: Group 1- children with dental caries Group 2-childern without dental caries.
Srilatha et al [17]	2018	India	Cross sectional study	3-6 years	Study group: def >5 Control group: def=0
Chand et al [18]	2018	India	Cross sectional study	4-14 years	Case group- caries active children with def/DMF score >5 Control group- caries free children with def/DMF score=0
Matar EA [19]	2018	Egypt	Cross sectional study	3-6 years	Group 1- dmfs score=0 Group 2- dmfs score>5

TABLE 2: Outcome of the studies based on the association of dermatoglyphic pattern and dental caries

Author Name	Sample Size	Patient Characteristics	Outcome	P Value
Bazmi et al [4]	300	300 children of aged 4-14 years were selected and are divided into two groups based on the presence or absence of dental caries and their hand prints were obtained.	There was a statistically significant difference was found between dermatoglyphics and dental caries among study and control groups.	< 0.001
Thakkar et al [5]	183	183 school children of aged 12 years were selected from Mangalore and are divided into three groups based on the DMFT/dmft score using WHO Proforma then their finger print was obtained using Cummins and milto method.	The dental caries are more prone among children with whorl pattern	<0.05
Kochhar et al [6]	99	99 children of aged 12-14 years were selected and are divided into two groups. One group for caries assessment and the other group for gingival and periodontal examination which was measured using DMFT index and O-S index then their finger prints were recoing Cummins and Mildo method.	The children with whorl pattern are more susceptible to dental caries than children with loop pattern	<0.005
Agravat et al [7]	200	200 children of aged 5-12 years were randomly selected from schools of Ahmadabad and they were divided into study and control groups based on the presence of dental caries which was assessed using def index. Then their finger prints were obtained based on Cummins and Mildo method.	There was a statistically significant relation was found between children with whorl pattern and dental caries.	<0.05
Vijender et al [8]	100	100 children of aged 5-12 years were obtained from Government schools of Patiala and they were divided into two groups based on the presence or absence of dental caries which was recorded using DMFT index. Then their finger prints were obtained using Cummins and Mildo method.	Children with whorl pattern had increase number of dental caries whereas the children with loop pattern had lowest dental caries	<0.05

Sanghani et al [9]	200	The 200 subjects of aged 6-13 years were selected and divided into two groups 100 children with caries active and 100 with no caries. Their hands prints were obtained and their dental caries were recorded using DMFT index.	The caries active children had more number of whorl pattern whereas the number of loop pattern was found to be highest among caries free children	<0.05
Deepti et al [10]	300	Samples of 300 children of aged 6-12 years were selected in Vadodara city, Gujarat and their hand prints were obtained. Their dental caries and malocclusion were recorded.	There was a statistically significant difference between dermatoglyphics and dental caries	< 0.03
Saxena et al [11]	276	A 276 number of children of aged 12-15 years were randomly selected from 6 private schools in Kanpur city and their finger prints were recorded using blue ink. Then their dental caries were assessed using DMFT index.	The children with whorl pattern had more number of dental caries whereas the children with loop pattern are caries free	<0.05
Singh et al [12]	512	512 children of aged 2-6 years were selected randomly from schools in Lucknow and are divided into three groups based on the dmft score which was assessed using WHO Proforma, 1997 and their finger prints were obtained using stamp pad.	Children with whorl pattern are more prone to dental caries	<0.05
Maroli et al [13]	100	100 school children of aged 5-12 years were obtained and are divided into caries free and caries active groups with equal number of males and females in both groups	There was a strong association was found between dental caries and dermatoglyphics. Dental caries was found to be more common among children with whorl pattern especially among females	Not specified
Elkwatehy et al [14]	200	200 children of aged 3-6years were selected from two kindergarten in Egypt and were divided into two groups based on the presence of dental caries using dmft index then their finger prints were recorded using stamp pad method.	Caries active children had more of whorl pattern finger prints. The children with loop pattern have lower dental caries	0.000

Kaur et al [15]	100	100 school children of aged 6-12 years were selected and divided into two groups equally based on the presence or absence of dental caries by using DMFT index. Their hand prints were obtained and their salivary pH were recorded using pH meter.	Children with dental caries had lower number of loop patterns and salivary pH levels when compared to those with absence of dental caries.	< 0.001
Reddy et al [16]	300	300 numbers of children aged 6-16 years were selected randomly from schools in Tripati city and their finger prints were obtained using Cummins and Mildo method. The dental caries of these children was examined using ICDAS method.	The children with whorl patterns had more prevalence of dental caries when compared to other patterns in both case and control groups.	0.002
Srilatha et al [17]	100	100 children of aged 3-6 years were randomly selected and they were divided into two groups based on the presence or absence of dental caries which was assessed using def index. Then their finger prints were recorded using ink pad stamp method and their streptococcus mutans level were assessed using bacterial culture	The children with whorl pattern had a higher of streptococcus mutans count.	<0.05
Chand et al [18]	100	100 children of aged 4-14 years were selected from Gujarat and are divided into two groups based on the presence of dental caries using def/DMF index. Then their finger prints were recorded.	There was a strong association was found between dermatoglyphics and dental caries	<0.05
Matar EA [19]	60	60 children of aged 3-6 years were selected in Egypt and were divided into two groups based on the dmfs score then their finger prints were recorded using Cummins and Mildo method.	Children with whorl pattern are more prone to dental caries whereas children with loop pattern are less susceptible to dental caries	<0.001

Table 3: Bias Assessment

Author name	Selection				Comparability	Outcome/ exposure	
	Sample representation	Sample size	Non-respondents	Risk factor		Assessment of outcome	Statistical test
Bazmi et al, 2013 [4]	*	-	*	*	*	-	*
Thakkar et al, 2014 [5]	*	-	*	*	*	-	*
Kochhar et al, 2014 [6]	-	-	*	*	*	-	*
Agravat et al, 2014 [7]	-	-	-	*	*	-	*
Vijender et al, 2014 [8]	-	-	*	*	*	-	*
Sanghani et al,2016 [9]	*	-	*	*	*	-	*
Deepti et al, 2016 [10]	-	-	*	*	*	-	*
Saxena et al, 2016 [11]	*	-	-	*	*	-	*
Singh et al, 2016 [12]	*	-	*	*	*	-	*
Maroli et al, 2016 [13]	-	-	*	*	*	-	-
Elkwatehy et al, 2016 [14]	-	-	*	*	*	-	*
Kaur et al,2018 [15]	-	-	*	*	*	-	*
Reddy et al, 2018 [16]	*	-	*	*	*	-	*
Srilatha et al,2018 [17]	-	-	-	*	*	-	*
Chand et al, 2018 [18]	*	-	*	*	*	-	*
Matar et al, 2018 [19]	-	-	*	*	*	-	*

*Denotes low risk bias, - denotes high risk bias

Discussion

Dental caries is one the complex microbial disease that predominantly spreads throughout the world. The dental caries was caused by many factors but the exact reason is unknown. Even though many advanced materials have been developed for the treatment of dental caries, the best approach for the dental caries is prevention. To prevent the disease, the early detection of the root cause or the risk factor of disease is most important. Dermatoglyphics plays a very crucial role in

detecting many systemic diseases such as dental caries.

The study conducted by Sanghani et al in the year 2016 had discussed about the correlation of dermatoglyphic pattern among 200 school children of aged 6-13 years in India and they were divided into two groups equally based on the presence of dental caries then their finger were recorded. The children with whorl pattern have more prevalence of dental caries when compared to those children with loop pattern and it has found to statistically significant (P<0.05) [9].

Kaur et al in the year 2018 had discussed about the pattern of dermatoglyphics among 100 children with dental caries of aged 6-12 years in India and were divided into study and control group. The children with DMFT score> 4 were selected as study group and those children with no dental caries were choosen as control group then their salivary pH and finger prints were recorded for analysing the correlation of dermatoglyphic pattern and dental caries and concluded. The children with loop patterns was found to be more in the control group than the study group and it was found to be statistically significant (p<0.001) [15].

Bazmi et al in the year 2013 had discussed about the association of dermatoglyphics and dental caries among 300 children of aged 4-14 years in India and concluded that there was a strong association was found between dental caries and dermatoglyphics pattern. The children with whorl pattern had more dental caries when compared to children with loop pattern and it was found to be statistically significant (p<0.001) [4].

The study conducted study conducted by Deepti et al in the year 2016 had discussed about the association of dermatoglyphics between dental caries and malocclusion among 300 school children of aged 6-12 years in India and concluded that the children with increased dental caries had a greater frequency of loop pattern when compared to other pattern (p<0.03) [10].

Reddy et al in the year 2018 had discussed about the association of dermatoglyphic pattern and dental caries among 300 special children of aged 6-16 years in India and concluded that the children with dental caries had more frequency of whorl pattern whereas the children without dental caries had more frequency of loop pattern and it was found to be statistically significant (p=0.002) [16].

Saxena et al in the year 2016 had discussed about the correlation of finger prints and dental caries among 276 school children of aged 12-15 years from randomly selected schools in Kanpur city, India and they were divided into three groups based on the DMFT scores. The study concluded that the whorl pattern was most common among caries active group whereas the loop pattern was common among caries free children and it was found to be statistically significant (p<0.05) [11].

Srilatha et al in the year 2018 had discussed about the dermatoglyphic pattern and their correlation with dental caries by evaluating the streptococcus mutans level among 100 children of aged 3-6 year old children in India and concluded that the level of streptococcus mutans was found to be highest among children with whorl pattern. There was a statistically significant relation was found be whorl pattern and streptococcus mutans level (p<0.05) [17].

Agravat et al in the year 2014 had discussed about the efficiency of the dermatoglyphic pattern in the prediction of dental caries. The study was conducted among 200 children of aged 5-12 years from various schools in Ahmedabad, India and concluded that there was a statistically significant relationship was found between finger prints of whorl pattern and dental caries (p<0.05) whereas the children with loop patterns are caries free [7].

Vijender et al in the year 2014 had discussed about the effectiveness of the dermatoglyphics in determining the presence of dental caries among 100 government school children of aged 5 and years in Patiala, India and concluded that the dermatoglyphic pattern was very effective in predicting dental caries and there was a strong positive correlation was children with whorl pattern and dental caries (p<0.05) [8].

Elkwatehy et al in the year 2016 had discussed about the efficiency of the pattern of the dermatoglyphics in detecting the early childhood caries among 200 childern of 3-6 years in Egypt and they were divided into two groups based on the presence or absence of dental caries. The study concluded that the dermatoglyphic pattern was very effective in predicting early childhood caries and it was found to be statistically significant (p=0.00).

The children with dental caries had highest frequency of dental caries whereas the loop pattern was found to more in caries free children [14].

The study conducted by Chand et al in the year 2018 had discussed about the cost effectiveness of dermatoglyphics in predicting dental caries among 100 school children of aged 4-14 years in Gujarat, India and are divided into two groups based on the presence or absence of dental caries. The study concluded that the dermatoglyphic pattern was very effective in predicting dental caries and it was found to be statistically significant ($p<0.05$) [18].

Maroli et al in the year 2016 had discussed about the dermatoglyphic pattern and its effectiveness in predicting dental caries among 100 school children of aged 5-12 years in India. There was a strong correlation was found between dermatoglyhic pattern and dental caries [13].

Kochhar et al in the year 2014 had discussed about the pattern of dermatoglyphics and its association with dental caries and Periodontitis among 90 children of aged 12- 14 years in North India and are divided into groups caries assessment group and periodontal assessment group. The study concluded that the children with whorl pattern has a significant increase of dental caries ($p<0.005$) whereas the children with loop pattern had less dental caries and there was no significant relationship was found between dermatoglyphic pattern and periodontal diseases [6].

Matar et al in the year 2018 had discussed about the association of dermatoglyphics and early childhood caries among 60 children of aged 3-6 years in Egypt and are divided into two groups equally children with dental caries and children without dental caries. The study concluded that there was a statistically significant relation was found between the two groups ($p<0.001$). The children with whorl pattern are more common in children with dental caries and the loop pattern was common in caries free children [19].

Singh et al in the year 2016 had discussed about the correlation of dermatoglyphic pattern and dental caries among 512 preschool children of aged 2-6 years in India and concluded the children with whorl pattern had more dental caries when compared to other patterns and are found to b e statistically significant ($p<0.05$). Another study conducted by Thakkar et el in the year 2014 had discussed about the relationship between dental caries and dermatoglyphics among 183 school children of aged 12 years in Mangalore, India by obtaining their finger prints and the dental caries status and concluded that there was a statistically significant relationship was found between children with whorl pattern and dental caries ($p<0.05$) [12,5].

Overall analysis of the study shows that the dermatoglyphics is a best cost effective tool in predicting dental caries. This will be most helpful to both the health care professionals and the public in general for easy and early identification of the dental caries especially among mentally disabled children. Moreover it is very cost effective when compared to other diagnostic instruments and was very useful to identify and prevent the dental caries.

Limitations:

Only cross sectionals have taken into an account. Many studies which outfts the criteria have been excluded. Other databases should also be considered. Many studies have conducted only in India further studies should be carried out in other countries to get more relevant outcome.

Conclusion

Dermatoglyphic pattern was very effective in predicting the dental caries and helps the people to detect and prevent the dental caries at an initial stage. The finger prints with whorl pattern are more prone to dental caries whereas the finger prints with loop pattern are less susceptible to dental caries.

Acknowledgement: Nil

Conflict of Interest: Nil

Ethical Clearance: Taken from the Institutional review committee of Public health dentistry department, SRM dental college, Ramapuram.

Source of Funding: Self

References

1. Veeresh T, Mujahid A, Deepu P, Sivaprakash R. Correlation between Dermatoglyphics, Dental

Caries and Salivary pH: An Invivo Study. Ethiopian journal of health sciences. 2019;29(1).

2. Shetty SS, Saran R, Swapna BV, Shetty S. Association of dermatoglyphics with dental caries and oral hygiene status. SRM Journal of Research in Dental Sciences. 2018 Jan 1;9(1):29.
3. Aggarwal VP, Goyal N, Batra M, Mathur A, Mathur A. Relationship of Dexterity with Dental Caries among Subjects Having Whorl Pattern: A Dermatoglyphic Study. 2019; 4(2):1-5.
4. Bazmi BA, Sarkar S, Kar S, Ghosh C, Mubtasum H. A cross sectional study of dermatoglyphics and dental caries in Bengalee children. Journal Of Indian Society of pedodontics and preventive dentistry. 2013 Oct 1;31(4):245.
5. Thakkar VP, Rao A, Rastogi P, Shenoy R, Rajesh G, Pai MB. Dermatoglyphics and Dental Caries: A Cross Sectional Study among 12 Year Old School Children in Mangalore, India. Indian Journal of Forensic Medicine and Pathology. 2014;7(1):19-25.
6. Kochhar GK, Shahi P, Advani S, Singh P, Kaushal S, Nangia T. Dermatoglyphics of dental caries and periodontal diseases in children of North India. J Pharm Biomed Sci. 2014;4:658-3.
7. Agravat D, Agarwal N, Patel P. Dermatoglyphics: A tool for dental caries prediction. J Adv Med Dent Sci Res. 2014 Jul;2:66-9.
8. Vijender V, Tarannum T, Pathak A. Dermatoglyphics interpretation of dental caries: An in vivo study. Int J Dent Med Res. 2015;1(6):54-6.
9. Sanghani PH, Soni HK, Joshi MU. Correlation of dental caries and dermatoglyphics in pediatric cases. Indian Journal of Dental Sciences. 2016 Jul 1;8(3):131.
10. Deepti A, Dagrus K, Shah V, Harish M, Pateel D, Shah N. Dermatoglyphics: A Plausible Role in Dental Caries and Malocclusion?. Indian J Oral Health Res 2016;2:32-5.
11. Saxena A, Pradhan D, Pruthi N. Dermatoglyphics and Dental Caries: A Correlation Study among School Children of Kanpur City, India. 2016 Dec: 3(4): 1-6.
12. Singh E, Saha S, Jagannath GV, Singh S, Saha S, Garg N. Association of dermatoglyphic peculiarities with dental caries in preschool children of Lucknow, India. International journal of clinical pediatric dentistry. 2016 Jan;9(1):39.
13. Maroli S, Korrai B, Premakumar SH, Gavini S, Vungarala AS, Wicks R. An in vivo Investigation into an Inexpensive Diagnostic Tool for Predicting Susceptibility to Dental Caries: Dermatoglyphics. Journal of Advanced Oral Research. 2016 Sep;7(3):26-30.
14. Elkwatehy WM, Sheta AR. Dermatoglyphics as a Non-Invasive Anatomical Marker in Early Childhood Caries. Int J Dentistry Oral Sci. 2016 Nov 23;3(11):366-71.
15. Kaur K, Mahajan N, Singh A, Bansal S, Kaur R. Dermatoglyphic patterns in children with dental caries: An In vivo Study. Indian Journal of Dental Sciences. 2018 Jan 1;10(1):16.
16. Reddy KV, Kumar KN, Subramaniyan V, Togaru H, Kannaiah S, Reddy R. Dermatoglyphics: a new diagnostic tool in detection of dental caries in children with special health-care needs. International Journal of Pedodontic Rehabilitation. 2018 Jan 1;3(1):18.
17. Srilatha A, Doshi D, Kulkarni S, Reddy MP, Reddy BS, Satyanarayana D. Determination and comparison of Dermatoglyphic patterns and salivary Streptococcus mutans counts and its correlation with dental caries among 3-to 6-year-old children. Oral Health Prev Dent. 2018 May 1;16(3):291-7.
18. Chand SC, Parmar HR, Patel JK, Bathvar AK, Garasiya NK, Nisarta PK. Praiseworthiness of Dermatoglyphics in Determining Dental Caries Vulnerability among Gujarati Children: A Cross-Sectional Study. Nat J Comm Med. 2018;9:453-7.
19. Matar MA. Relation between Dermatoglyphicsand Early Childhood caries in a group of Egyptian children. Egyptian Dental Journal. 2018 Jul 1;64(3-July (Orthodontics, Pediatric & Preventive Dentistry)):1955-60.