



UNIVERSITI PUTRA MALAYSIA

***PREVALENCE AND ASSOCIATED FACTORS OF DENTAL CARIES
AMONG 8-12 YEAR-OLD CHILDREN IN LIBYAN SCHOOLS IN KLANG
VALLEY, MALAYSIA***

AISHA AGEIL ABDULLAH ABUAISHA

FPSK(M) 2016 28



**PREVALENCE AND ASSOCIATED FACTORS OF DENTAL CARIES AMONG
8-12 YEAR-OLD CHILDREN IN LIBYAN SCHOOLS IN KLANG VALLEY,
MALAYSIA**

By

AISHA AGEIL ABDULLAH ABUAISHA

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfillment of the Requirements for the Degree of Master of Science**

June 2016

COPYRIGHT

All material contained within the thesis, including without limitation text, logos, icons, photographs, and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright© Universiti Putra Malaysia



DEDICATION

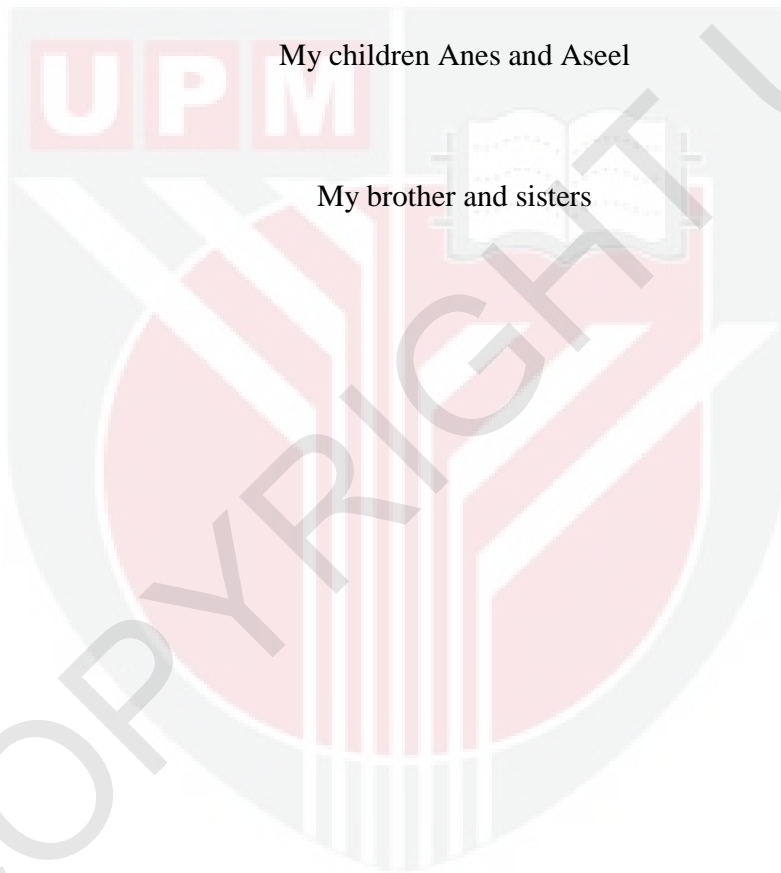
To

My mother and father

My dear husband Adel M Hamed and

My children Anes and Aseel

My brother and sisters



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

**PREVALENCE AND ASSOCIATED FACTORS OF DENTAL CARIES AMONG
8-12 YEAR-OLD CHILDREN IN LIBYAN SCHOOLS IN KLANG VALLEY,
MALAYSIA**

By

AISHA AGEIL ABDULLAH ABUAISHA

June 2016

Chairman : Huda Binti Zainuddin, PhD
Faculty : Medicine and Health Sciences

Dental caries is the most common oral disease in children and adults in developed and developing countries and is the main cause of loss of teeth in younger people; it continues to be a major public health concern, dental caries are increasing over time. Libya is one of the few countries that have increased caries prevalence among children. This disease is greatly affected by many risk factors. The objective of this study was to determine the prevalence of dental caries and associated factors among Libyan school children in Klang Valley aged 8 to 12 years. A cross-sectional study was conducted among three Libyan schools in Klang Valley. Proportionate stratified sampling method was used to select the children. A total of 570 respondents were selected. Dental caries were assessed using the WHO (1987) criteria. Information about dietary habits, socio-demographic and oral hygiene habits were collected through a dental health questionnaire. Dental examination of children was done using mouth mirror and dental explorer. The data were analyzed using IBM (SPSS) Version 20.0. Chi-square test was used to test the association and to determine the risk factors of dental caries, binary multiple logistic regression analyses were applied. The prevalence of dental caries was 55.8%, females have higher dental caries than males. Dental caries was found highly prevalent among; children aged ≤ 10 years (64.7%), children whose fathers and mothers have a job (58.5% and 58.7% respectively), children whose fathers and mothers have elementary level of education (69.6% and 61.0% respectively), children who have poor oral hygiene (99.0%), children who consume high cariogenic food (91.7%), children who consume high cariogenic drinks (95.2%) and children who preferred to eat sweet snacks and sweet drinks at all times (65.7% and 62.9% respectively). Moreover, there were significant association between dental caries with age group, fathers education level, oral hygiene habits; consumption of cariogenic food, consumption of cariogenic drinks and total score of dietary habits, also, young age (OR=11.78, 95% CI: 2.30-26.27), high cariogenic drinks (OR=9.95, 95% CI: 2.44-16.97) and poor oral hygiene (OR=8.97, 95% CI: 4.76-33.29) were predictors for dental caries among children. In conclusion, dietary habits, oral hygiene habits and socio-demographic characteristic are identified as modifiable risk factors that related to dental caries among Libyan school children at age 8-12 years in Malaysia. Health education on good oral hygiene habits should be emphasized among younger Libyan school children.

Keywords:

Dental caries, Oral hygiene habits, dietary habits, Libyan school children.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

**PREVALENS DAN BERSEKUTU FAKTOR KARIES GIGI DI KALANGAN
KANAK-KANAK 8-12 TAHUN SEKOLAH LIBYA DI LEMBAH KLANG,
MALAYSIA**

Oleh

AISHA AGEIL ABDULLAH ABUAISHA

Jun 2016

Pengerusi : Huda Binti Zainuddin
Fakulti : Perubatan dan Sains Kesihatan

Karies gigi adalah penyakit mulut yang paling biasa pada kanak-kanak dan orang dewasa di negara-negara maju dan membangun dan merupakan punca utama kehilangan gigi pada orang muda; ia terus menjadi satu masalah kesihatan awam yang utama, karies gigi semakin meningkat dari semasa ke semasa. Libya adalah salah satu daripada beberapa negara yang telah menunjukkan peningkatan kelaziman karies di kalangan kanak-kanak. Penyakit ini dipengaruhi oleh banyak faktor-faktor risiko. Objektif kajian ini adalah untuk menentukan kelaziman karies gigi dan faktor yang berkaitan di kalangan kanak-kanak sekolah Libya di Klang di kalangan kanak-kanak kumpulan umur 8 hingga 12 tahun. Satu kajian keratan rentas telah dijalankan di kalangan tiga buah sekolah Libya di Lembah Klang. Perkadaran kaedah persampelan berstrata telah digunakan untuk memilih kanak-kanak. Jumlah saiz sampel adalah 570 responden. Karies gigi dinilai menggunakan criteria WHO (1987). Maklumat mengenai tabiat pemakanan, tabiat kebersihan sosio-demografi dan lisan dikumpulkan melalui soal selidik kesihatan mulut. Pemeriksaan gigi kanak-kanak telah dilakukan dengan menggunakan cermin mulut dan pemeriksa pergigian. Data dianalisis menggunakan aplikasi IBM (SPSS) versi 20.0. Ujian khi-kuasa dua telah digunakan untuk memeriksa pergaulan dan untuk menentukan faktor risiko karies gigi, analisis binari regresi logistik digunakan. Kelaziman karies gigi adalah 55.8%, perempuan mempunyai karies gigi yang lebih tinggi daripada lelaki. Karies gigi, biasanya ditemui di kalangan; kanak-kanak berusia ≤ 10 tahun (64.7%), bapa kanak-kanak dan ibu-ibu mempunyai pekerjaan (58.5% dan 58.7% masing-masing), bapa-bapa dan ibu-ibu kanak-kanak mempunyai pendidikan peringkat rendah (69.6% dan 61.0% masing-masing), anak-anak yang mempunyai tahap kebersihan mulut yang rendah (99.0%), kanak-kanak yang mengambil makanan berkariogenik yang tinggi (91.7%), kanak-kanak yang mengambil minuman berkariogenik yang tinggi (95.2%) dan kanak-kanak yang lebih suka makan makanan ringan yang manis dan minuman bergula pada setiap masa (65.7% dan 62.9% masing-masing). Di samping itu, terdapat hubungan yang signifikan di antara kerosakan gigi mengikut kumpulan umur, tahap pendidikan ibu bapa, tabiat kebersihan mulut; pengambilan kariogenik makanan, tabiat kariogenik pemakanan dan jumlah skor, juga, umur yang rendah (OR=11.78, 95% CI: 2.30-26.27), minuman kariogenik tinggi (OR=9.95, 95% CI: 2.44-16.97) dan kebersihan mulut yang rendah (OR=8.97, 95% CI: 4.76-33.29) adalah prediktor yang menentukan kerosakan gigi di kalangan kanak-kanak. Kesimpulannya, tabiat pemakanan, tabiat kebersihan mulut dan ciri-ciri sosio-demografi

dikenal pasti sebagai faktor risiko yang boleh diubahsuai yang dikaitkan dengan kerosakan gigi di kalangan kanak-kanak sekolah Libya yang berumur 8-12 tahun di Malaysia. Pendidikan kesihatan tentang tabiat kebersihan mulut perlu ditekankan di kalangan kanak-kanak sekolah Libya di Malaysia.

Kata kunci:

Karies gigi, tabiat Kebersihan mulut, tabiat makan, kanak-kanak sekolah Libya.



ACKNOWLEDGEMENTS

In the name of Allah, firstly, most merciful, most gracious, all my praise and thanks are to Allah who has provided me with the strength and capacity to complete this thesis.

I would like to thank my supervisor, Dr. Huda Binti Zainuddin for her continual support, supervision, useful advice, discussions, encouragement and guidance throughout my thesis. I consider myself very lucky to be given this honour to work with her. I would also like to thank Dr. Suriani Binti Ismail for her help and generous support during the study.

Acknowledgments go to the headmasters, parents, children and schools staff in Libyan schools in Klang Valley, Malaysia for their spontaneous and genuine collaboration. This research would not have been possible without them. I would also like to thank the Libyan Government for sponsoring my study. This research is supported by UPM Grant 2015 (GP-IPS/2015/9454800).

Finally, my deepest thanks go to my family, my father, my mother, my dear husband Adel M Hamed and my children Anes and Aseel for their patience, support and encouragement throughout the period of my study. I present my thanks to all who shared in supporting me either directly or indirectly.

I certify that a Thesis Examination Committee has met on 29 June 2016 to conduct the final examination of Aisha Ageil Abdullah Abuaisa on her thesis entitled "Prevalence and Associated Factors of Dental Caries among 8-12 Year-Old Children in Libyan Schools in Klang Valley, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

Kulanthayan a/l K.C. Mani @ Subramanian, PhD

Associate Professor
Faculty of Medicine and Health Science
Universiti Putra Malaysia
(Chairman)

Ahmad Azuhairi Ariffin, PhD

Senior Lecturer
Faculty of Medicine and Health Science
Universiti Putra Malaysia
(Internal Examiner)

Mohamad Ikhsan bin Selamat, PhD

Senior Lecturer
Universiti Teknologi MARA
Malaysia
(External Examiner)



ZULKARNAIN ZAINAL, PhD

Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 28 September 2016

This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

Huda Binti Zainuddin, PhD

Senior Lecturer
Faculty of Medicine and Health Science
Universiti Putra Malaysia
(Chairman)

Suriani Binti Ismail, PhD

Senior Lecturer
Faculty of Medicine and Health Science
Universiti Putra Malaysia
(Member)



BUJANG BIN KIM HUAT, PhD

Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software

Signature: _____ Date: _____

Name and Matric No: Aisha Ageil Abdullah Abuaisha, GS 40262

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

Signature: _____

Name of Chairman
of Supervisory
Committee:

Dr. Huda Binti Zainuddin

Signature: _____

Name of Member
of Supervisory
Committee:

Dr. Suriani Binti Ismail

TABLE OF CONTENTS

	Page
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iv
APPROVAL	v
DECLARATION	vii
LIST OF TABLES	xii
LIST OF FIGURES	xiii
CHAPTER	
1 INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	2
1.3 Justification of the study	3
1.4 Research Questions	3
1.5 Objectives	4
1.5.1 General Objectives	4
1.5.2 Specific Objectives	4
1.6 Research Hypothesis	4
2 LITERATURE REVIEW	5
2.1 Introduction	5
2.2 Definition of dental caries	5
2.3 Structure of the teeth	6
2.3.1 Enamel	6
2.3.2 Dentin	6
2.3.3 Pulp	6
2.3.4 Cementum	7
2.4 Diagnosis of dental caries	8
2.5 Prevalence of dental caries among school children	9
2.6 The impact of dental caries on quality of life	10
2.7 Factors associated with dental caries	11
2.7.1 Dental caries and age	11
2.7.2 Dental caries and gender	12
2.7.3 Dental caries and parent job status	12
2.7.4 Dental caries and parents level of education	13
2.7.5 Dental caries and oral hygiene habits	14
2.7.6 Dental caries and dietary habits	15
2.7.6.1 Cariogenic food and cariogenic drinks	16
2.7.7 Fluoride application	17
2.7.8 Genes and effects on dental caries	18
2.8 Conceptual framework	19
3 METHODOLOGY	20
3.1 Study Location	20
3.2 Study Population	20
3.3 Inclusion and exclusion criteria	20

3.4	Study Design	20
3.5	Sampling Frame	20
3.6	Sampling Unit	21
3.7	Sample Size	21
3.8	Study Variables	22
3.9	Data collection technique	23
	3.9.1 Independent Variable	23
	3.9.2 Dependent Variable	23
3.10	Study Instruments	24
	3.10.1 Questionnaire	24
	3.10.1.1 Socio-demographic characteristics	24
	3.10.1.2 Oral hygiene habits	24
	3.10.1.3 Dietary habits	24
	3.10.2 Oral examination	25
3.11	Data collection technique	25
3.12	Quality Control	25
	3.12.1 Reliability of Questionnaire	25
	3.12.2 Validity of Questionnaire	26
3.13	Data analysis	26
3.14	Ethical consideration	26
3.15	Operational definition	27
	3.15.1 Dental caries	27
	3.15.2 Age group	27
	3.15.3 Dietary habits	27
	3.15.3.1 Cariogenic food	27
	3.15.3.2 Cariogenic drinks	27
	3.15.3.3 Oral hygiene habits	27
4	RESULTS AND DISCUSSION	28
4.1	Response Rate	28
4.2	Socio-demographic characteristics of students	28
	4.2.1 Age and Gender	28
	4.2.2 Parent job status and parents level of education	29
4.3	Prevalence of dental caries	29
4.4	Oral hygiene habits	30
4.5	Dietary habits (related to dental caries)	32
	4.5.1 Cariogenic food	32
	4.5.2 Cariogenic drinks	32
4.6	Associations of dental caries with socio-demographic characteristics	34
4.7	Association between oral hygiene habits and dental caries	35
4.8	Association between dietary habits and dental caries	36
	4.8.1 Cariogenic food	36
	4.8.2 Cariogenic drinks	36
4.9	Risk factors of dental caries	37
5	CONCLUSION	41
5.1	Response rate	41
5.2	Prevalence of dental caries among respondents	41
5.3	Association of socio-demographic characteristic with dental caries	42
	5.3.1 Age	42
	5.3.2 Gender	42

5.3.3	Parents job status	43
5.3.4	Parents level of education	43
5.4	Association of oral hygiene habits with dental caries	44
5.5	Association of dietary habits with dental caries	44
5.5.1	Cariogenic food and cariogenic drinks	44
5.6	Risk factors for dental caries	45
5.6.1	Socio-demographic characteristics	45
5.6.1.1	Age	45
5.6.2	Oral hygiene habits	45
5.6.3	Dietary habits	46
5.6.3.1	Cariogenic drinks	46
6	CONCLUSION AND RECOMMENDATIONS	47
6.1	Summary and conclusion	47
6.2	Recommendations	47
6.3	Limitation of Study	48
6.4	Strength of Study	48
6.5	Recommendation for future study	48
	REFERENCES	49
	APPENDICES	61
	BIODATA OF STUDENT	80

LIST OF TABLES

Table		Page
3.1	Calculation of sample size from proportions of dental caries in literature review	22
3.2	Number of student at each school	23
4.1	Age and gender distribution of respondents	29
4.2	Parents job status and parents level of education distribution of respondents	29
4.3	Dental caries distribution of respondents	30
4.4	Percentage of respondents according to oral hygiene habits	31
4.5	Percentage of respondents according to dietary habits	32
4.6	Associations of dental caries with socio-demographic characteristics	35
4.7	Association between oral hygiene habits and dental caries	35
4.8	Association between dietary habits and dental caries	37
4.9(a)	Risk factors of dental caries	38
4.9(b)	Predictors of dental caries	40

LIST OF FIGURES

Figure	Page
2.1 Structure of the tooth	7
2.2 Decayed tooth	8
2.3 Conceptual Framework of associated factors of dental caries among children aged 8-12 years of Libyan schools in Klang Valley Malaysia	19
4.1 Response rates of participants	28



CHAPTER 1

INTRODUCTION

1.1 Background

Dental caries or tooth decay is a multi-factorial disease that usually affects people of all ages throughout their lives which – through interacting with food, dental plaque and micro-organisms over a long period of time – leads to final destruction of the proper of the teeth, including dental enamel, dentin and tooth cement (Fejerskov, 2004). Dental caries is a very common and important dental public health problem and it is the mainly prevalent oral disease among children in the world (Featherstone, 2004). Dental caries is five times more common than asthma and seven times as common as hay fever thus, the most common childhood chronic disease. Even in low- risk population decay, dental caries is still a very common childhood illness (Yabao et al., 2005).

Poor oral health is harmful to children because it is affecting their growth, development and nutrition. Oral diseases in childhood, in case if untreated it leads to pain, development of dento-facial anomalies and other serious health problems, such as severe dental pain, dental abscess, damage to the bone, and complicates from infection through the bloodstream (USDHHS, 2000). World Health Organization (WHO, 2013) exposed that oral disease limits the activities of all ages and has caused millions of school and work hours to be lost each year globally. Dental caries in primary teeth can cause a negative impact on the health of children from both long term and short term in their lives (Bader et al., 2004).

In a number of developing countries caries prevalence has been affecting 60-90% of schoolchildren (Petersen, 2005). The prevalence of dental caries is of great interest for long and is a major subject of many epidemiological kinds of research carried out in our country and abroad (Tobias, 2008). This disease causes not only damage to the teeth, but it is also responsible for several diseases for the oral cavity and other systems of the body (Petersen et al., 2005). The pattern of dental caries prevalence different not only with age, gender, socioeconomic status, race, dietary habits, and practices of oral health and geographical location but also within the oral cavity of the person (Bader et al., 2004).

The assessment of dental caries risk factor is very important. It gives a chance to improve oral hygiene, dietary habits, and implement preventive measures in an exposed population. Reisine and Poster (2001) consider that the factors of risk of dental caries contain biological and physical factors (for instance, high number of cariogenic immunological and bacterial components) and behavioural factors (including poor dietary habits, poor oral hygiene, and inadequate use of services of dental health care) and other risk factors (including social status, poverty and

deprivation). In the developed countries, a decline in the prevalence of dental caries has been attributed to population-based preventive programs by use of fluoride, enhanced participation in oral health programs and changes in oral hygiene and dietary habits (Adeniyi Abiola et al., 2009).

Diet was related to the dental caries prevalence; sugar consumption is the main cause of dental caries (Burt, 2001). Dental caries significantly increased between the 17th and 19th centuries where the availability and consumption of the sugar increased (Touger, 2003). Caries prevalence has been increasing in developing countries as a result of a change of diet and increase of sugar consumption. The frequency of sugar consumption is mainly important; with evidence suggesting that consumption more than 4 times each day is likely to produce dental caries. Nevertheless, lower levels of dental caries are found in countries where average sugar consumption is less than 15-20 kg for every year, equating to 6-10% of energy intake (Sohn et al., 2006).

Prevalence of dental caries according to previous studies in Libya, reported that the prevalence of dental caries among Libyan school children the percentage of dental caries was 56.9% (Baccush and Nayak, 1991) and 57.8% (Huew, 2010). On the contrary, comparing the prevalence of dental caries among school children in Libya with school children in other countries was higher than it was in Iran (36.2%) (Momeni et al., 2006), Italy (43.1%) (Campus et al., 2007), Tunisia (48.3%) (Abid , 2004), the United Kingdom (32.7%) (Pitts et al., 2006), India (10%) (Bradley & Wendel, 2009) and Nigeria (35.5%) (Okoye & Ekwueme, 2013). Another study conducted by Elfaki et al., (2014), which found that the prevalence of dental caries was (20.31 %) among 10-11 years whereas among 12-13 years old (13.02 %).

Development of dental caries during the primary dentition frequently results in dental caries development in the permanent and mixed dentition as well. Those aged 8 to 12 years old are at the mixed dentition stage (Kassawara et al., 2010). Consequently, it is important to study this age group of school children for developing essential education and intervention in this area.

1.2 Problem statement

The social impact of dental caries in children is very high. More than 51 million school hours are lost every year to dental-related illness (Li & Wang , 2002). Poor children have almost 12 times more restricted activity days related dental caries than children from high-income families. Children eating habits and nutritional intake could be affected by caries, possibly affecting the development of the early childhood, growth and school willingness (Ghazaryan, 2007). Infection and pain from dental caries are resulting problem in learning, speaking and eating as well as poor school attendance. Dental caries continues to be the most important problem and it should receive special attention (Bagramian et al., 2009).

Early loss of teeth or tooth decay might lead to health problems such as malnutrition. The quality of life is affected by dental caries and its complications, both physiologically and physically (Petersen, 2004). Losing of primary teeth early may lead to a variety of opposing consequences, like psychological and aesthetic problems as well as gastro-intestinal disorders. Caries of early childhood could dramatically raise a child risk for permanent dental caries in future. In the case of non-treatment of dental caries and development to it, leading to inflammation, it may lead to the break and take it off and lose it (Sheiham, 2006).

In many Arab countries, dental caries is still increasing over time, mainly since the relatively recent economic growth, which has led to increased consumption of sugar, easy availability of sweet foods and altered diet. Lack of awareness about oral health practices has also contributed to the increase in dental caries (Gandeh, & Milaat, 2000).

Libya is one of the few countries that have increasing caries prevalence among children though not as dramatic as in the industrialized countries (WHO, 2000). The treatment of dental caries is expensive, sometimes leading to complex procedures of treatment and rehabilitation. Consequently, it imposes a massive financial burden for the individual and society (Ferreira et al., 2007).

There were no known studies done among school children especially for Libyan school children living in another country especially in Malaysia. Also, this study was undertaken to fill the knowledge gap about dental caries among this age group of the population who are not the indigenous population in the country.

1.3 Justification of the study

There was no such data available and published article for dental caries on school children among this age group especially for Libyan resident in Malaysia. Therefore, this study was undertaken to obtain information about risk factors of dental caries and dietary habits and oral hygiene habits. This prevalence can be used as reference data in case of future study related to dental caries. One more interesting outcome is data findings will be useful for planning for the prevention of dental caries.

1.4 Research Questions

1. What is the prevalence of dental caries among Libyan school children aged 8-12 years old who study in Libyan schools in Klang Valley, Malaysia?
2. Is there an association between prevalence of dental caries with socio-demographic characteristics (age, gender, parents' job status and parents' level of education)?
3. Is there an association between prevalence of dental caries with oral hygiene habits?
4. Is there an association between prevalence of dental caries with dietary habits?
5. What are the risk factors of dental caries?

1.5 Objectives

1.5.1 General Objectives

To determine the dental caries prevalence and associated factors among children aged 8-12 years of Libyan schools in Klang Valley.

1.5.2 Specific Objectives

1. To determine the socio-demographic characteristics (age, gender, parents' job status and parents' level of education) among 8-12 years old children attending Libyan schools in Klang Valley.
2. To determine oral hygiene habits (good and poor) and dietary habits (cariogenic food and cariogenic drinks).
3. To determine the prevalence of dental caries.
4. To determine the association between socio-demographic characteristics (age, gender, parents' job status and parents level of education) with dental caries.
5. To determine the association between oral hygiene habits and dietary habits with dental caries.
6. To determine the risk factors for dental caries.

1.6 Research Hypothesis

There is a significant association between socio-demographic characteristics (age, gender, parents' job status and parents' level of education) with dental caries.

There is a significant association between oral hygiene habits and dietary habits with dental caries.

REFERENCES

- Abid A. (2004). Oral health in Tunisia. *International Dental Journal* 54:389-394.
- Acs G., Lodolini G., Kaminski S., Cisneros G.J. (1992). Effect of nursing caries on body weight in a pediatric population. *Pediatric Dentistry*; 14:302-5.
- Addo-Yobo C., Williams S,A.& Curzon M,E,J. (1991). Dental caries experience in Ghana among 12 year old urban and rural school children. *Caries Res*; 25:311–314.
- Adeniyi Abiola, A., Ogunbodede Eyitope, O., Jeboda Sonny, O., Sofola Oyinkan, O.(2009). Dental caries occurrence and associated oral hygiene practices among rural and urban Nigerian pre-school Children. *Journal of Dentistry and Oral Hygiene*;1(5): 64-70.
- Ahmed N., Astrom A.& Skaug N. (2007). Dental caries prevalence and risk factors among 12 year-old schoolchildren from Baghdad, Iraq: a post-war survey. *International Dental Journal* 57:36-44.
- Akpata, E. S., Al-Shammery, A. R., & Saeed, H. I. (1992). Dental caries, sugar consumption and restorative dental care in 12–13-year-old children in Riyadh, Saudi Arabia. *Community Dentistry and Oral Epidemiology*, 20(6), 343-346.
- Al-Dosari A., Wyne A., Akpata E.& Khan N. (2004). Caries prevalence and its relation to water fluoride levels among schoolchildren in Central Province of Saudi Arabia. *International Dental Journal*, 54:424-428.
- Al-Haddad A.M., Ghouth A.S.& Hassan, H.S. (2006). Distribution of Dental Caries among Primary School Children in Al-Mukalla Area, Yemen. *Journal of Dentistry, Tehran University of Medical Sciences*, 3 (4):195-198.
- Al-Ismaily M., Al-Busaidy K.&Al-Khussaiby, A. (2004). The progression of dental disease in Omani schoolchildren. *International Dental Journal*, 54:409-410.
- Al-Malik, M. I., Holt, R. D., & Bedi, R. (2001). The relationship between erosion, caries and rampant caries and dietary habits in preschool children in Saudi Arabia. *International Journal of Paediatric Dentistry*, 11(6), 430-439.
- Al-Sharbati M, Meidan T, Sudani O. (2000). Oral health practices and dental caries among Libyan pupils, Benghazi (1993-94). *Eastern Mediterranean Health Journal*, 6:997-1004.
- Amin, T. T., & Al-Abad, B. M. (2008). Oral hygiene practices, dental knowledge, dietary habits and their relation to caries among male primary school children in Al Hassa, Saudi Arabia. *International Journal of Dental Hygiene*, 6(4), 361-370.

- Atta, K. (2015). *The Prevalence of Dental Caries among Sudanese Dental Students* (Doctoral dissertation, UOFK).
- Auad S, Waterhouse P, Nunn J. & Moynihan P. (2009). Dental caries and its association with socio demographics, erosion, and diet in schoolchildren from southeast. *Brazil Pediatric Dentistry*, 31:229-235.
- Baccush, M.M., Nayak, C.S .(1991). Prevalence of dental caries in school children from a suburban area in Tripoli, Libya. *Acta Stomatologica Croatica* 25:11-15.
- Bader, J.D., Rozier ,R.G., Lohr, K.N. (2004).Physicians' roles in preventing dental caries in preschool children. Systematic Evidence Review. *American Journal Prev Med*, 26(4) :315–325.
- Bagramian, R. A., Garcia-Godoy, F., & Volpe, A. R. (2009). The global increase in dental caries. A pending public health crisis. *American Journal of Dentistry*, 22(1), 3-8.
- Behbehani, J.& Scheutz ,F. (2004). Oral health in Kuwait. *International Dental Journal*, 54(6):401-408.
- Beirut N, van Palenstein Helderman W (2004). Oral health in Syria. *International Dental Journal* 54:383-388.
- Bonica J.J., Loeser J.D., Chapman C.R.& Fordyce W.E. (1990). The management of pain. General considerations of chronic pain in Philadelphia: *Lea and Febiger*;1: 180-196.
- Bradley C. & Wendell E. (2009). Has urbanization become a risk factor for dental caries in Kerala, India: a cross-sectional study of children aged 6 and 12 years. *International Journal of Paediatric Dentistry*, 19:330-337.
- Burt, B.A., Eklund, S.A., Morgan, K.J., Larkin, F.E., Guire, K.E. & Brown LO, et al. (1988). The effects of sugars intake and frequency of ingestion on dental caries increment in a three-year longitudinal study. *Journal of Dental Research*, 67:1422-1429.
- Burt,B.A. (2001). Sugar consumption and caries risk: a systematic review. *Journal of Dental Education*, 65(10):1017-1023.
- Campus G., Solinas G., Cagetti M., Senna A., Minelli L. & Majori S, et al. (2007). National Pathfinder survey of 12 year-old children's oral health in Italy. *Caries Research*, 41:512- 517.
- Chankanka O .(2010). Dietary intake and dental caries in children. PhD (Doctor of Philosophy thesis, University of Iowa, 2010.
- Cheng, Y. C., Huang, H. K., Wu, C. H., Chen, C. C., & Yeh, J. I. (2014). Correlation between dental caries and diet, oral hygiene habits, and other indicators among

elementary school students in Xiulin Township, Hualien County, Taiwan. *Tzu Chi Medical Journal*, 26(4), 175-181.

Cleaton-Jones P., Chosack A., Haregraves A. & Fatti L.P. (1994). Dental caries and social factors in 12 year old South African children. *Community Dent Oral Epidemiol*; 22:25–29.

Curnow M.M., Pine C.M., Burnside G., Nicholson J.A., Chesters R.K., & Huntington E. (2002). A randomised controlled trial of the efficacy of supervised toothbrushing in high-caries-risk children. *Caries Res*, 36(4): 294-300.

Cvikl, B., Haubenberger-Prabl, G., Drabo, P., Haggmann, M., Gruber, R., Moritz, A., & Nell, A. (2014). Migration background is associated with caries in Viennese school children, even if parents have received a higher education. *BMC Oral Health*, 14(1), 51.

Datta, P., & Datta, P. P. (2013). Prevalence of Dental Caries among School Children in Sundarban, India. *Epidemiology: Open Access*, 2013.

De la Rosa, M. (1978). Dental caries and socioeconomic status in Mexican children. *Journal of dental research*, 57(3), 453-457.

Delgado-Angulo, E. K., & Bernabé, E. (2006). Influence of host-related risk indicators on dental caries in permanent dentition. *Acta Odontol Latinoam*, 19(2), 85-92.

Dixit, L.P., Shakya, A., Shrestha, M & Shrestha, A. (2013). Dental caries prevalence, oral health knowledge and practice among indigenous Chepang school children of Nepal, *BMC Oral Health*, 13(1), 20.

Douglass, J. M., Tinanoff, N., Tang, J. M., & Altman, D. S. (2001). Dental caries patterns and oral health behaviors in Arizona infants and toddlers. *Community Dentistry and Oral Epidemiology*, 29(1), 14-22.

Dye B.A., Tan S., Smith V., Lewis B.G., Barker L.K., & Thornton-Evans et al., (2007). Trends in oral health status: United States, 1988-1994 and 1999-2004. *Vital Health Stat*, 11 248):1-92.

Elfaki N. K., Elgarrai A. S. E. & Ibraheem A. (2014). Prevalence of Dental Caries among Primary School Attendees in Najran-Saudi Arabia. *Journal of Dental and Medical Sciences*, 13(11), 37-41.

Ellwood R, Fejerskov O. (2003). Clinical use of fluoride. In: Fejerskov O, Kidd EAM. Dental caries, the disease and its clinical management. Oxford London, Blackwell Munksgaard.

Featherstone, J.D.B. (2004). The continuum of dental caries-evidence for a dynamic disease process. *Journal Dental Res*, 83:39-42.

- Fejerskov, O. (2004). Changing paradigms in concepts on dental caries. Consequences for oral health care. *Journal Dent Res*, 38(3): 182-191.
- Ferreira, S.H., Beria, J.U., Kramer, P.F., Feldens, E.G. & Feldens, C.A. (2007). Dental caries in 0- to 5-year-old Brazilian children prevalence, severity, and associated factors. *International Journal Paediatr Dent*, (17):289-296.
- Gandeh, M.B.S. & Milaat, W.A. (2000). Dental caries among schoolchildren. report of a health education campaign in Jeddah, Saudi Arabia 1996-97. *Eastern Mediterranean Health Journal*, (2/3):396-401.
- Ghandour I.A. (1992). Caries prevalence among 3-5 year old children in Khartoum. *JID*.
- Ghazaryan, V. E. (2007). Implementation and evaluation of school-based dental caries preventive program: proposal. *American University of Armenia, College of health Sciences A*; 63:415-7.
- Gibson, S., & Williams, S. (1999). Dental caries in pre-school children: associations with social class, toothbrushing habit and consumption of sugars and sugar-containing foods. *Caries research*, 33(2), 101-113.
- Gift H.C., Reisine S.T. & Larach D.C. (1992). The social impact of dental problems and visits. *American Journal of Public Health*; 82:1663-8.
- Goyal, A., Gauba, K., Chawla, H. S., Kaur, M., & Kapur, A. (2007). Epidemiology of dental caries in Chandigarh school children and trends over the last 25 years. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 25(3), 115.
- Granville-Garcia A.F., de Menezes V.A., de Lira P.I., Ferreira J.M., & Leite-Cavalcanti A. (2008). Obesity and dental caries among preschool children in Brazil. *Rev Salud Publica*, 10(5): 788-795.
- Grewal H, Verma M, Kumar A. (2009). Prevalence of dental caries and treatment needs in the rural child population of Nainital District, *Uttaranchal. Journal of Indian Society of Pedodontics and Preventive Dentistry*, 27:224.
- Guthrie, J. F., & Morton, J. F. (2000). Food sources of added sweeteners in the diets of Americans. *Journal of the American Dietetic Association*, 100(1), 43-51.
- Hallett, K.B. & Rourke O. (2002). Dental caries experience of preschool children from the north Brisbane region. *Australian Dental Journal*; 47(4):331-333.
- Harris R, Nicoll A, Adair P, Pine C. (2004). Risk factors for dental caries in young children: a systematic review of the literature. *Community Dental Health*, 21(1): 71-85.
- Hartmann R, W. (2008). Ludwig's Angina in Children, hosted on the American Academy of Family Physicians website. Page accessed May 25, 2008.

- Hashim R., Thomson W., Ayers K., Lewsey J.& Awad M. (2006). Dental caries experience and use of dental services among preschool children in Ajman, UAE. *International Journal of Paediatric Dentistry*, 16:257.
- Hawew R (1995). An assessment of the dental health of six and twelve year old children in Benghazi and Jardinah, Libya, Published Msc.thesis, University of Manchester. 87- 22.
- Huew,R.(2010). Dental erosion in Libyan schoolchildren and its association with potential risk Factors. School of Dental Sciences University of Newcastle upon Tyne. *Int J Paediatr Dent*, 22(1):68-76.
- Huew, R., Waterhouse, P.J., Moynihan ,P.J., Kometa ,S.& Maguire, A.(2011). Dental erosion and its association with diet in Libyan schoolchildren. *Eur Arch Paediatr Dent*,12(5) :234-240.
- Huew, R., Waterhouse, P., Moynihan, P., Kometa, S., & Maguire, A. (2012). Dental caries and its association with diet and dental erosion in Libyan schoolchildren. *International Journal of Paediatric Dentistry*, 22(1), 68-76.
- Huew, R.,Waterhouse, P.J.,Moynihan, P.J.&Maguire ,A.(2011). Prevalence and severity of dental caries in Libyan schoolchildren. *International Dental Journal*, 61(4):217–223.
- Ingafou M., Omar S., Hamouda, S.& Bellal M. (2003). Oral Health Status and treatment needs of preschool children in Benghazi. *Garyounis Medical Journal*, 20:31-39.
- Ingle, N. A., Dubey, H. V., Kaur, N., & Gupta, R. (2014). Prevalence of dental caries among school children of Bharatpur city, India. *Journal of International Society of Preventive & Community Dentistry*, 4(1), 52.
- Jamieson L., Thomson W.& Mcgee R .(2004). Caries prevalence and severity in urban Fijian schoolchildren. *International Journal of Paediatric Dentistry* 14:34-40.
- Jeppesen, B. A., & Foldspang, A. (2006). Can the development of new dental caries in Danish schoolchildren be predicted from surveillance data in the School Dental Service?. *Community Dentistry and Oral Epidemiology*, 34(3), 205-212.
- Jiang ,H., Petersen, P.E., Peng, B., Tai, B.,& Bian ,Z (2005).Self-assessed dental health, oral health practices, and general health behaviors in Chinese urban adolescents. *Acta Odontol Scand*, 63:343-352.
- Johnson, Clarke. (2007). Biology of the Human Dentition." Page accessed July 18, 2007.
- Joyson M, Rangeet BN, Gurunathan D.(2011). Prevalence of dental caries, socio-economic status and treatment needs among 5-15 year old school going children of Chidambaram. *J Clin Diagn Res*;5:146-51.

- Julihn, A., Barr Agholme, M., Grindefjord, M., & Mod er, T. (2006). Risk factors and risk indicators associated with high caries experience in Swedish 19-year-olds. *Acta Odontologica Scandinavica*, 64(5), 267-273.
- Kapoor A.K., Ray S.K., Kaur P, Reddy D.C.S.& Nagchoudhary J. (1980). Dental caries and its relationship to materials used for cleaning teeth and frequency of cleaning teeth. *JIDA*;52:81-83.
- Karjalainen, S., S oderling, E., Sewon, L., Lapinleimu, H., & Simell, O. (2001). A prospective study on sucrose consumption, visible plaque and caries in children from 3 to 6 years of age. *Community Dentistry and Oral Epidemiology*,29(2), 136-142.
- Kassawara A.B., Tagliaferro E.P., Cortelazzi K.L., Ambrosano G.M., Assaf A.V.,& Meneghim Mde C .,et al. (2010). Epidemiological assessment of predictors of caries increment in 7-10- year-olds: a 2-year cohort study. *J Appl Oral Sci*, 18(2): 116-120.
- Khan N. B., Al Ghannam N. A., Al Shammery A. R. & Wyne, A. H. (2000). Caries in primary school children: prevalence, severity and pattern in Al-Ahsa, Saudi Arabia. *Saudi Dental Journal*, 13(2), 71-74.
- Kiwanuka, S.N., Astrom, A.N.,& Trovik, T.A. (2005).Dental caries experience and its relationship to social and behavioural factors among 3-5-year-old children in Uganda. *Int J Paediatr Dent* 2004 14: 336-346. 8. Petersen PE. Sociobehavioural risk factors in dental caries-international perspectives. *Community Dent Oral Epidemiol* 4: 274- 279.
- Kiwanuka S., Astrom A.&Trovik T. (2006). Sugar snack consumption in Ugandan schoolchildren: validity and reliability of a food frequency questionnaire. *Community Dentistry Oral Epidemiology*, 34:372-380.
- Li,Y& Wang,W.(2002) Predicting caries in permanent teeth from caries in primary teeth an eight-year cohort study. *Journal of Dental Research*, 81(8):561-566.
- Locker D. (1997). Concepts of oral health, disease and the quality of life. In: Slade GD, Measuring oral health and quality of life. University of North Carolina, Dental Ecology p 11-23.
- Luo Y., Zeng X., Du M.& Bedi R. (2005). The prevalence of dental erosion in preschool children in China. *Journal of Dentistry*, 33:115-121.
- Lwanga SK and Lemeshow S (1991). Sample size Determination in Health Studies: A Practical Manual. Geneva: World Health Organization.
- Mahfouz, M., & Abu Esaid, A. (2014). Dental Caries Prevalence among 12–15 Year Old Palestinian Children. *International Scholarly Research Notices*, 2014.

- Mangueira D., Sampaio F. & Oliveira A. (2009). Association between socioeconomic factors and dental erosion in Brazilian schoolchildren. *Journal of Public Health Dentistry*, 69:254-259.
- Marrs, J.A., Trumbley ,S.,& Malik, G. (2011) Early childhood caries: determining the risk factors and assessing the prevention strategies for nursing intervention. *Pediatr Nurs*; 37(1):9-15.
- Marshall, T. A., Eichenberger-Gilmore, J. M., Broffitt, B. A., Warren, J. J., & Levy, S. M. (2007). Dental caries and childhood obesity: roles of diet and socioeconomic status. *Community Dentistry and Oral Epidemiology*, 35(6), 449-458.
- Mattila, M. L., Rautava, P., Ojanlatva, A., Paunio, P., Hyssälä, L., Helenius, H., & Sillanpää, M. (2005). Will the role of family influence dental caries among seven-year-old children?. *Acta Odontologica Scandinavica*, 63(2), 73-84.
- Mehta, A., & Mehta, A. (2012). Comprehensive review of caries assessment systems developed over the last decade. *RSBO: Revista Sul-Brasileira de Odontologia*, 9(3).
- Miyazaki ,H.&Morimoto, M .(1996). Changes in caries prevalence in Japan. *European Journal of Oral Sciences*, 104:452-458.
- Momeni A., Mardi M.& Pieper K. (2006). Caries Prevalence and tretment needs of 12-yearold children in the Islamic Republic of Iran. *Medical Principles and Practice*, 15:24-28.
- Mondelli J., Sene F., Ramos R. P. & Benetti A. R. (2007). Tooth structure and fracture strength of cavities. *Brazilian Dental Journal*, 18(2), 134-138.
- Moses,J., Rangeeth,B.N. & Gurunathan,D. (2011). Prevalence Of Dental Caries, Socio-Economic Status And Treatment Needs Among 5 To 15 Year Old School Going Children Of Chidambaram Thai Mogambigai., *Journal of Clinical and Diagnostic Research* ,5(1):146-151.
- Moynihan,Paula. &Poul, Erik, Petersen. (2004). Diet, nutrition and the prevention of dental diseases. *Public Health Nutrition* ,7(1):201-226.
- Murshid, E. Z. (2014). Diet, oral hygiene practices and dental health in autistic children in Riyadh, Saudi Arabia. *Oral Health Dent Manag*, 13, 91-6.
- Nasr, .M., Mohe, M.& El Masry E.S.(2014) . Prevalence of Dental Caries in Child School from two Libya's Western Cities with Different Levels of Fluoride in Their Drinking Water . *Academic Journal* ,12 (1):28.
- National Advisory Committee on Oral Health. (2004). Healthy Mouths Healthy Lives: Australia's National Oral Health Plan 2004-2013, A Committee Established by the Australian Health Ministers' Conference, p. 27.

- Nibras, A.M., Ahmed., Anne, N., Astrom. & Skaug, N. (2007). Dental caries prevalence and risk factors among 12-year old schoolchildren from Baghdad, Iraq: a post-war survey. Bergen, Norway, *International Dental Journal*, 57:36-44.
- Normak S. (1993). Social indicators of dental caries among Sierra Leonean school children. *Scand J Dent Research.* ; 101:121–129.
- Nurelhuda, N. M., Trovik, T. A., Ali, R. W., & Ahmed, M. F. (2009). Oral health status of 12-year-old school children in Khartoum state, the Sudan; a school-based survey. *BMC Oral Health*, 9(1), 15.
- Nyvad, B., Machiulskiene, V., & Bælum, V. (2003). Construct and predictive validity of clinical caries diagnostic criteria assessing lesion activity. *Journal of Dental Research*, 82(2), 117-122.
- Okada, M., Kawamura, M., Kaihara, Y., Matsuzaki, Y., Kuwahara, S., Ishidori, H., & Miura, K. (2002). Influence of parents' oral health behaviour on oral health status of their school children: an exploratory study employing a causal modelling technique. *International Journal of Paediatric Dentistry*, 12(2), 101-108.
- Okoye L. O. & Ekwueme O. C. (2013). Prevalence of dental caries in a Nigerian rural community: A preliminary local survey. *Annals of Medical and Health Sciences Research*, 1(2), 187-196.
- Oliveira, L. B., Sheiham, A., & Bönecker, M. (2008). Exploring the association of dental caries with social factors and nutritional status in Brazilian preschool children. *European Journal of Oral Sciences*, 116(1), 37-43.
- Oo M.M.T., Naing L., Mani S.A., & Ismail A.R. (2011). Dental caries experience and treatment needs in the mixed dentition in North East Malaysia. *Arch Orofac Sci*, 6(2): 41-48.
- Petersen P.E., Hoerup N., Poomviset N., Prommajan J., & Watanapa A (2001). Oral health status and oral health behaviour of urban and rural schoolchildren in Southern Thailand. *Int Dent J*, 51(2): 95-102.
- Petersen P.E., Bourgeois ,D., Ogawa, H., Estupinan-Day ,S. & Ndiaye, C.(2005). The global burden of oral diseases and risks to oral health. *Bull World Health Organ*, 83(9): 661-669.
- Petersen P.E. (2003). Changing oral health profiles of children in Central and Eastern Europe- challenges for the 21st century. *Community Dental Health*, 20:211-216.
- Petersen P.E. (2004) Effective use of fluorides for the prevention of dental caries in the 21st century. *The WHO approach. Community Dentistry and Oral Epidemiology*, 32(5):319-321.

- Petersen, P.E.(2005). Socio behavioural risk factors in dental caries-international perspectives. *Community Dent Oral Epidemiology*, 33(4):274-279.
- Piovesan, C., Mendes, F. M., Antunes, J. L. F., & Ardenghi, T. M. (2011). Inequalities in the distribution of dental caries among 12-year-old Brazilian schoolchildren. *Brazilian Oral Research*, 25(1), 69-75.
- Pitts N., Boyles J., Nugent Z., Thomas N.& Pine C. (2006). The dental caries experience of 11 year-old children in Great Britain (2004/2005). Survey coordinated by the British Association for the study of community dentistry. *Community Dental Health*, 23:44-57.
- Punitha, V. C., Amudhan, A., Sivaprakasam, P., & Rathanaprabu, V. (2015). Role of dietary habits and diet in caries occurrence and severity among urban adolescent school children. *Journal of pharmacy & bioallied sciences*, 7(Suppl 1), S296.
- Reisine, S.T., Litt, M., & Tinanoff, N. (1994). A biopsychosocial model to predict caries in preschool children. *Pediatric Dentistry*, 16, 413-413.
- Reisine, S.T., Poster, W. (2001).Socio-economic status and selected behavioural determinants as risk factors for dental caries. *J Dent Educ*; 65 (10): 1009-1016.
- Roberson T.M. (2002) .Art and Science of Operative dentistry. 4 Ed: Mosby, Inc.
- Rodrigues, C. S., & Sheiham, A. (2000). The relationships between dietary guidelines, sugar intake and caries in primary teeth in low income Brazilian 3-year-olds: a longitudinal study. *International Journal of Paediatric Dentistry*,10(1), 47-55.
- Rugg-Gunn A, Hackett A, Appleton D, Jenkins G, Eastoe J (1984). Relationship between dietary habits and caries increment assessed over two years in 405 English adolescent school children. *Archives of Oral Biology*, 29:983-992.
- Rugg-Gunn A.J. (1993). Nutrition and Dental Health. Oxford: Oxford Medical Publications.
- Ruhaya H., Jaafar N., Jamaluddin M., Ismail A.R., Ismail N.M., Badariah T.C., Azizah M.,& Mohamed S.Z. (2012). Nutritional status and early childhood caries among preschool children in Pasir Mas, Kelantan, Malaysia. *Arch Orofac Sci*, 7(2): 56-62.
- Sahito N., Sahito, M. A., & Fazlani, K. A. (2015). Prevalence of Dental Caries among School Children in Hyderabad Pakistan. *International Annals of Advanced Scientific Research*, 2(1), 001-005.
- Selwitz R.H., Ismail A.I.& Pitts N.B. (2007). Dental caries. *Lancet* 2007; 369:51-9.
- Sheiham, A (2001). Dietary effects on dental diseases. *Public Health Nutrition* 4:569-591.

- Sheiham, A. (2006). Dental caries affects body weight, growth and quality of life in pre-school children. *British Dental Journal*, 201(10):625-626.
- Shetty N.&Tandon S .(1988). Prevalence of dental caries as related to risk factors in schoolchildren of South Kanara. *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 6:30-37.
- Shingare, P., Jogani, V., Sevekar, S., Patil, S., & Jha, M. (2012). Dental caries prevalence among 3-to 14-year-old school children, Uran, Raigad District, Maharashtra. *J Contemp dent*, 2(2), 11-14.
- Singh S., Kaur G.,& Kapila V.K.(1985). Dental disorders in primary school children of Faridkot City. *JIDA*;57:305-8.
- Slade,G.D.(2001) Epidemiology of dental pain and dental caries among children and adolescents. *Community Dental Health*,18(4):219-227.
- Smith, L., Blinkhorn, A., Moir, R., Brown, N., & Blinkhorn, F. (2015). An assessment of dental caries among young Aboriginal children in New South Wales, Australia: a cross-sectional study. *BMC public health*, 15(1), 1.
- Sofrata A., Brito F., Al-Otaibi M.& Gustafsson A.(2011).Short term clinical effect of active and inactive *Salvadora persica* miswak on dental plaque and gingivitis. *J Ethnopharmacol.*; 137 (3):1130-4.
- Sohi, K. R., Gambhir, R. S., Veerasha, K. L., Randhawa, A. K., & Singh, G. (2012). Assessment of prevalence of dental caries among 5 and 12-year-old school children in Chandigarh (UT), India. *Archives of Oral Research*, 8(1), 39-45.
- Sohn ,W., Burt, B.A.& Sowers, M.R. (2006). Carbonated soft drinks and dental caries in the primary dentition. *J Dent Res*, 85(3): 262-266.
- Spencer, A.J. (2004). Narrowing the Inequality Gap in Oral Health and Dental Care in Australia. Australian Health Policy Institute, The University of Sydney, p. 11.
- Sreebny L (1982). Sugar availability, sugar consumption and dental caries. *Community Dentistry Oral Epidemiology*, 10:1-7.
- Stecksén-Blicks, C., Rydberg, A., Nyman, L., Asplund, S., & Svanberg, C. (2004). Dental caries experience in children with congenital heart disease: a case-control study. *International Journal of Paediatric Dentistry*, 14(2), 94-100.
- Sudha, P., Bhasin, S.& Anegundi ,R. (2005). Prevalence of dental caries among 5-13 years old children of Mangalore city, *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 23(2):74-79.
- Sundby, A.,& Petersen, P.E.(2003). Oral health status in relation to ethnicity of children in the municipality of Copenhagen, Denmark. *Int J Paediatr Dent* 3: 150-157.

- Taani ,Q. (2004). Oral health in Jordan. *International Dental Journal*, 54:395-400.
- Tobias ,Rodrigo,(2008) Prevalence of dental caries and treatment needs among 12-year-old children in a small-sized municipality in the Amazon region. *Revista Brasileira de Epidemiologia,SciELO Public Health*,11(4):608-618.
- Togoo RA, Yaseen SM, Lall S, Algarni FAS, Faraj A, Shah FK.(2012). Prevalence of first permanent molar caries among 7-10 years old school going boys in Abha City, Saudi Arabia. *Bangladesh Journal of Medical Science.*;11:98–102.
- Touger-Decker,R.(2003) Sugar and dental caries .*The American journal of clinical Nutrition*,78(4):881-892.
- United States Department of Health and Human Services (USDHHS). (2000). Oral Health in America: A Report of the Surgeon General. National Institute of Health.
- Vallejos-Sanchez A.A., & Gutierrez Salazar M.P. (1998). Prevalence and severity of dental flurosis and caries in schoolchildren 6-12 years old in Campeche, Mexico-1997. [MSc Thesis]. Campeche, Mexico: Universidad de Campeche.
- Waitzman N.J., Scheffler R.M.& Romano P.S. (1996). The cost of birth defects: estimates of the value of prevention. Lanham (MD): University Press of America.
- Walker A, Gregory J, Bradnock G, Nunn J, White D, editors .(2000). National Diet and Nutrition survey: Young people aged 4 -18 years. Vol 2: Report of the oral health survey, pp.292. London: The Stationary Office.
- Wang ,X., Shaffer, J.R., Weyant, R.J., Cuenco, K.T., DeSensi, R.S.& Crout R, et al. (2010).Genes and their effects on dental caries may differ between primary and permanent dentitions. *Caries Res*, 44:277-284.
- Wendt, L. K., Hallonsten, A. L., Koch, G., & Birkhed, D. (1994). Oral hygiene in relation to caries development and immigrant status in infants and toddlers.*European Journal of Oral Sciences*, 102(5), 269-273.
- World Health Organization.(1987). Oral Health Surveys basic method. 4th edition: Geneva, WHO; 1987.
- World Health Organization. (2000).Global Data on Dental Caries Prevalence (DMFT) in Children Aged 12 years. Global Oral Data Bank. Oral health country/area profile programme, Management of non communicable diseases N12: Geneva, (2000).
- World Health Organization. (2003). Oral Health Promotion: An Essential Element of a Health-Promoting School. WHO Information Series on School Health N11: Geneva , (2003).

World Health Organization. (2013). Oral Health Country/Area Profile. Available from: <http://www.who.int/oral_health/databases/malmo/en/>.

Wyne, A. H., & Khan, N. (1995). Use of Sweet Snacks, Soft Drinks and Fruit Juices, Tooth Brushing and First Dental Visit in High DMFT 4-6 Year Olds of Riyadh Region. *Indian J Dent Res*, 6(1), 21-24.

Yabao, R.N., Duante, C., Velandria, F., Lucas, M., Kassu, A., Nakamori, M., & Yamamoto, S. (2005). Prevalence of dental caries and sugar consumption among 6–12-y-old schoolchildren in La Trinidad, Benguet Philippines. *European Journal of Clinical Nutrition*, 59(12):1429–1438.

Yee R.& Sheiham A.(2002). The burden of restorative dental treatment for children in Third World countries. *International Dental Journal*; 52:7-10.

Zahara A.M., Fashihah M.H.,& Nurul A.Y .(2010). Relationship between frequency of sugary food and drink consumption with occurrence of dental caries among preschool children in Titiwangsa, Kuala Lumpur. *Malays J Nutr*, 16(1): 83-90.