EVALUATING THE EFFECT OF MOTHER'S NUTRITION DURING THE GESTATION PERIOD RECOMMENDED BY WHO ON THE PREVALENCE OF DENTAL CARIES AND DENTOFACIAL DEFORMITY IN ADOLESCENTS

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ABSTRACT

Background Maternal nutrition during pregnancy plays a crucial role in fetal odontogenesis and craniofacial development. Deficiencies in essential nutrients may adversely affect enamel formation and facial growth, increasing the risk of dental caries and dentofacial deformities in offspring. **Aim:** To evaluate the association between maternal nutrition during gestation and the prevalence of dental caries and dentofacial deformities among adolescents aged 10–15 years. **Materials and Methods:** A cross-sectional observational study was conducted among 400 mother–adolescent pairs attending Inderprastha Dental College and Hospital, Ghaziabad. Maternal nutritional status during pregnancy was assessed using a structured questionnaire based on World Health Organisation guidelines. Dental caries was evaluated using the Decayed, Missing, and Filled Teeth (DMFT) Index, while dentofacial deformities were assessed using the Dental Aesthetic Index (DAI) and Facial Index (FAI). Statistical analysis was performed using One-Way ANOVA and Post Hoc Tukey's test, with significance set at $p \leq 0.05$. **Results:** A significant association was observed between maternal nutrition and DMFT ($p = 0.009$) as well as DAI scores ($p < 0.001$). Adolescents born to mothers with poorer nutritional status exhibited higher DMFT and DAI scores compared with those whose mothers had better nutritional status. No significant association was found between maternal nutrition and FAI scores ($p = 0.383$). Gender-wise analysis showed significantly higher DAI and FAI scores among males, while age-wise analysis revealed higher DAI and FAI scores among adolescents aged 13–15 years ($p < 0.001$). **Conclusion:** Poor maternal nutrition during gestation is associated with increased dental caries experience and greater dentofacial deformities in adolescents. These findings highlight the importance of adequate maternal nutrition during pregnancy and support the inclusion of nutritional counselling in routine antenatal care to improve long-term oral health outcomes.

Keywords: Maternal nutrition, Gestation, Adolescents, Dental caries, Dentofacial deformities, DMFT, DAI.

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INTRODUCTION

The World Health Organisation (WHO) recommends adequate maternal nutrition during pregnancy, including sufficient intake of iron, folic acid, iodine, vitamin D, calcium, and other essential micronutrients, to support optimal fetal growth and development. Maternal nutrition influences not only birth outcomes but also the formation and mineralisation of dental and craniofacial structures in the developing fetus. 1,2,3

Nutritional deficiencies during pregnancy can impair enamel formation and craniofacial development, increasing the risk of dental caries and dentofacial deformities later in life. Adequate levels of vitamin D, calcium, phosphorus, and other minerals are essential during critical periods of odontogenesis and skeletal development. 4

Dental caries and dentofacial deformities are among the most common oral health problems affecting adolescents worldwide. Although previous studies have reported associations between maternal nutritional deficiencies and early childhood oral diseases, evidence regarding their long-term effects on adolescent oral health remains limited. 4,6,7,9,10

Therefore, the present study aimed to evaluate the association between maternal nutrition based on WHO recommendations during pregnancy and the prevalence of dental caries and dentofacial deformities among adolescents. Understanding this relationship may help strengthen prenatal healthcare strategies and improve long-term oral health outcomes. 2,4,6,7,10,11

AIM:

The study aims to evaluate the effect of the mother's nutrition during gestation period recommended by WHO on the prevalence of dental caries and dentofacial deformities in adolescents.

OBJECTIVES:

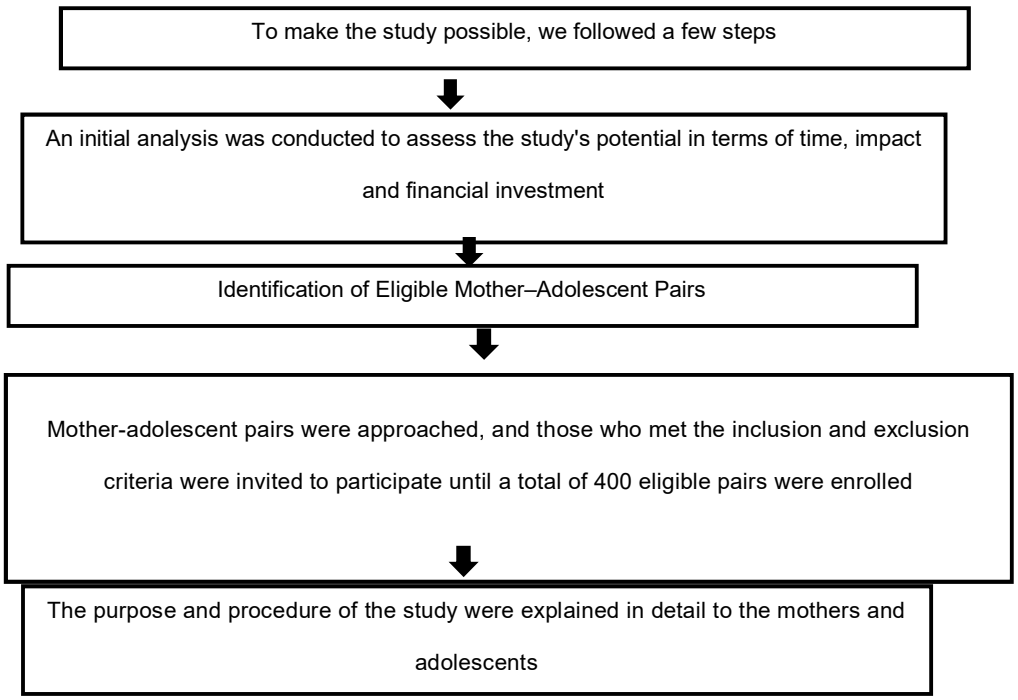
1. To evaluate the effect of mothers' nutrition during the gestation period recommended by WHO on gender predilection and the prevalence of dental caries in adolescents.
2. To evaluate the effect of mothers' nutrition during the gestation period recommended by WHO on gender predilection and the prevalence of dentofacial deformities in adolescents.
3. To correlate the prevalence of dental caries and dentofacial deformities in adolescence with the mother's nutrition during the gestation period recommended by WHO.

MATERIALS AND METHODS:

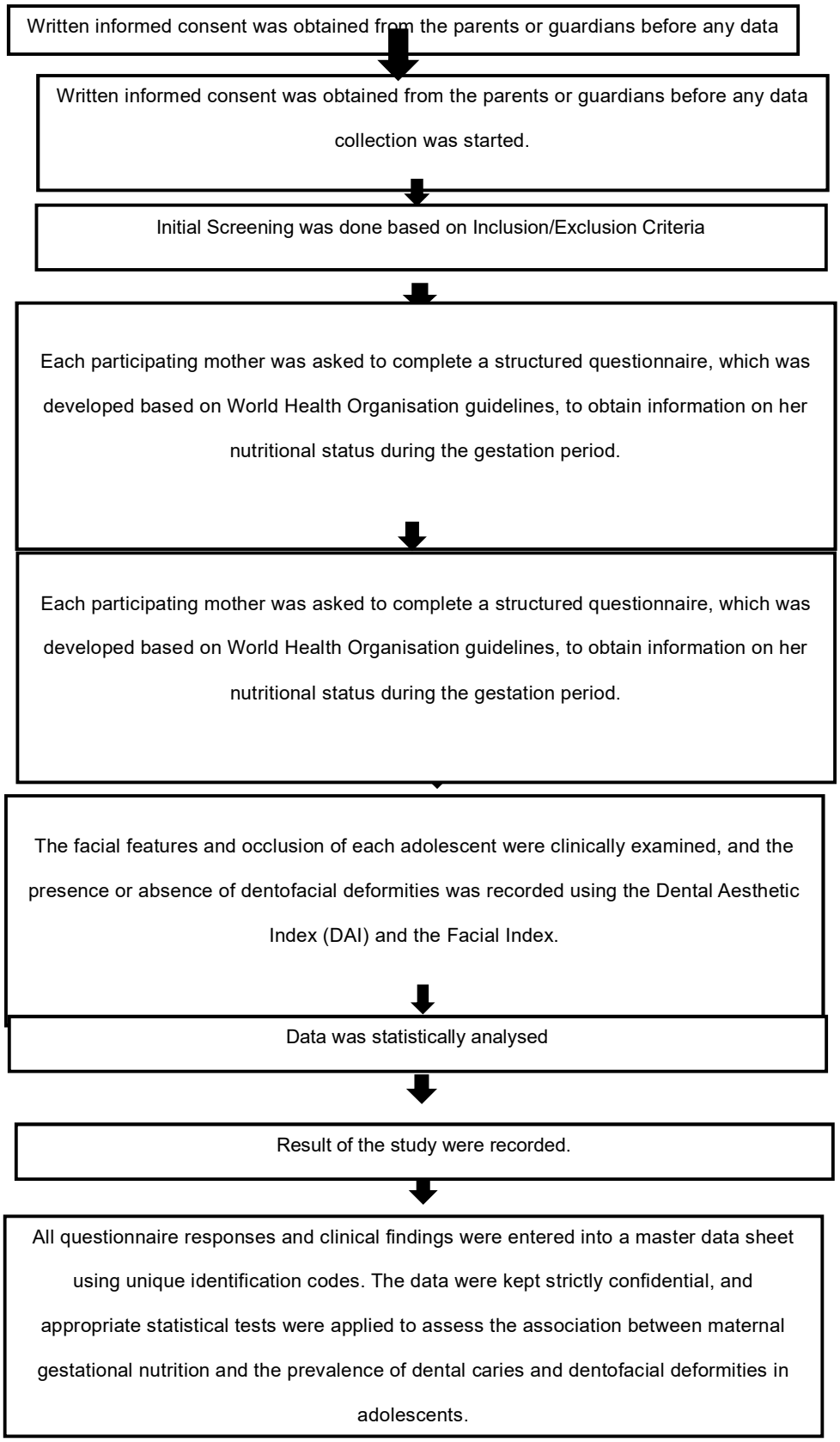
STUDY DESIGN:

The study was conducted in Inderprastha Dental College and Hospital, Ghaziabad. And the Children of the adolescent age group visiting Inderprastha Dental College and Hospital with their mother were taken into account.

A sample size of 400 children from the adolescent age group was included in the study, based on the established inclusion and exclusion criteria.



TITLE: EVALUATING THE EFFECT OF MOTHER'S NUTRITION DURING THE GESTATION PERIOD RECOMMENDED BY WHO ON THE PREVALENCE OF DENTAL CARIES AND DENTOFACIAL DEFORMITY IN ADOLESCENTS



SAMPLE SELECTION:

The study was conducted in Inderprastha Dental College and Hospital, Ghaziabad. Children of the adolescent age group visiting Inderprastha Dental College and Hospital were considered for the study. A sample size of 400 mothers & children from the adolescent age group was included in the study based on the established inclusion and exclusion criteria.

INCLUSION CRITERIA FOR THE STUDY:

Only those subjects were included who met the following inclusion criteria –

- Only one mother-adolescent pair per family was considered.
- The study involved only adolescents.
- Parent/Guardian gave consent for the study.
- Cooperative patients were included**.**

EXCLUSION CRITERIA FOR THE STUDY:

- Patients with special healthcare needs.
- Uncooperative patients.
- Children not in the adolescent period.
- Patients without informed consent**.**
- More than one child from a family was not considered.

SAMPLING:

A sample size of 400 mothers & children from the adolescent age group was included in the study based on the established inclusion and exclusion criteria

STUDY METHODS/TOOLS:

It is an observational study.

Materials used for the study:

- Kidney tray
- Mouth mirror
- Periodontal probe
- Tweezer
- Cotton
- Cotton dispenser
- Disposable gloves
- Instrument pouch
- Data recording sheets, pen, and pencils
- Head cap
- Mouth mask
- Patient drape
- Autoclave
- Disinfecting solutions
- Consent form
- Divider
- Ruler

FIGURE 1: Kidney tray

FIGURE 2: Mouth mirror, Periodontal probe, Tweezer

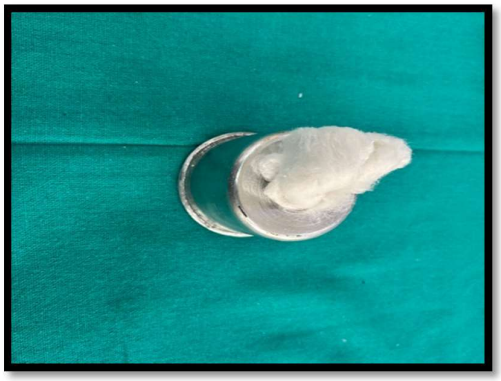


FIGURE 3: Cotton, Cotton dispenser

FIGURE 4: Disposable gloves

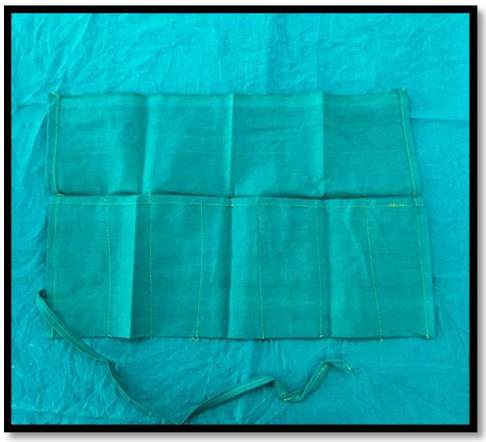


FIGURE 5: Instrument pouch

FIGURE 6: Head cap

FIGURE 7: Mouth mask solutions

FIGURE 8: Patient drape

FIGURE 9: Autoclave

FIGURE 10: Disinfecting solutions

FIGURE 11: Ruler

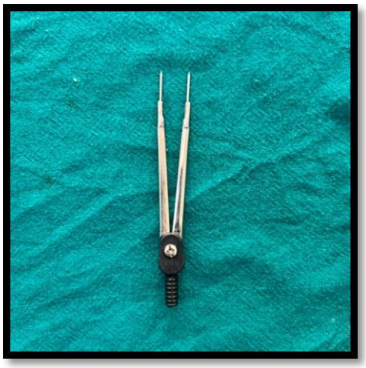
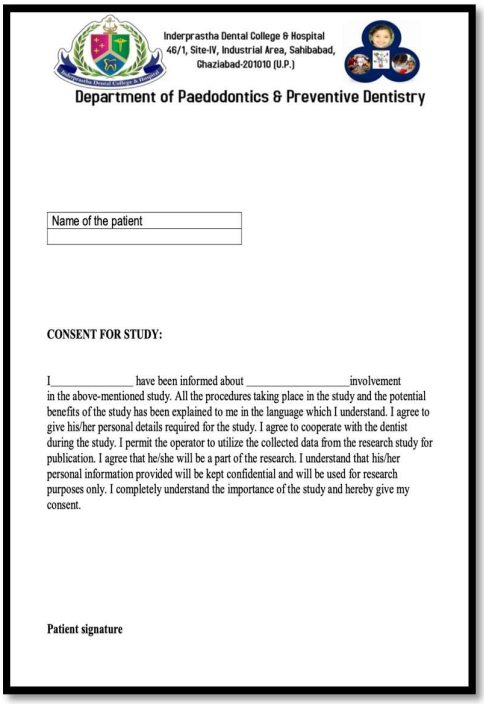


FIGURE 12: Divider

FIGURE 13: Data recording sheets, pen, and pencils



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Ghaziabad-201010 (U.P.)

Department of Paedodontics & Preventive Dentistry

Name of the patient

CONSENT FOR STUDY:

I_____ have been informed about _____involvement in the above-mentioned study. All the procedures taking place in the study and the potential benefits of the study has been explained to me in the language which I understand. I agree to give his/her personal details required for the study. I agree to cooperate with the dentist during the study. I permit the operator to utilize the collected data from the research study for publication. I agree that he/she will be a part of the research. I understand that his/her personal information provided will be kept confidential and will be used for research purposes only. I completely understand the importance of the study and hereby give my consent.

Patient signature

FIGURE 14: Consent form

DATA COLLECTION PROCEDURE:

Ethical clearance was obtained from the ethical committee at the Indraprastha Dental College and Hospital.

- A total of 400 mother–adolescent pairs were recruited for the study. Participants were selected from individuals visiting the Inderprastha Dental College and Hospital during the study period. Consecutive sampling was adopted to ensure a representative cross-section of the adolescent population reporting to the institution.
- Mothers and their adolescent children who met the inclusion criteria were approached personally. The purpose, nature, and expected duration of the study were clearly communicated to ensure transparency and voluntary participation.
- Each participant was provided with a detailed verbal and written explanation of the study objectives, procedures, potential benefits, and confidentiality safeguards. Mothers were informed about the examination procedures involving both themselves and their children, as well as the voluntary nature of participation.
- Written informed consent was obtained from all mothers before any data collection. Consent procedures adhered to ethical guidelines laid down by the Institutional Ethics Committee.
- A preliminary screening process was conducted to verify eligibility based on predefined inclusion and exclusion criteria. This screening included:
- Obtaining basic demographic details.

- Verifying the adolescent's age.
- Confirming maternal history relevant to pregnancy and nutrition.

♦ Ensuring the absence of systemic diseases or conditions that could influence craniofacial development or dental caries prevalence.

♦ Only participants who fulfilled all criteria were enrolled on the study.

♦ Eligible mothers were then asked to complete a structured questionnaire developed in accordance with the World Health Organisation (WHO) guidelines on maternal nutrition during pregnancy.

♦ The questionnaire was administered in a face-to-face setting to ensure accurate comprehension and to minimise response errors.

♦ Each adolescent underwent a standardised intraoral examination to assess dental caries status. Examinations were performed under adequate illumination using sterile instruments (mouth mirror and explorer). Caries detection was conducted using the Decayed, Missing, and Filled Teeth (DMFT) Index**,** as per WHO Oral Health Survey Methods.

♦ All findings were recorded systematically in pre-designed clinical examination sheets. To reduce examiner variability, all examinations were performed by a calibrated examiner.

♦ Following the oral examination, adolescents were evaluated for dentofacial deformities through:

- **Dental Aesthetic Index (DAI):** Used to assess malocclusion severity based on established scoring criteria.
- **Facial Index:** Measurement of vertical and horizontal facial dimensions using standard anthropometric techniques.

♦ All collected data—including questionnaire responses, DMFT scores, DAI findings, and facial measurements—were entered into structured data sheets prepared for the study.

♦ The verified data were subsequently transferred into digital format for statistical processing.

CLINICAL PROCEDURES:

FIGURE 15 & 16: Questionnaire administered through direct interaction with the mother.

FIGURE 17 & 18: Intraoral examination for DMFT index assessment

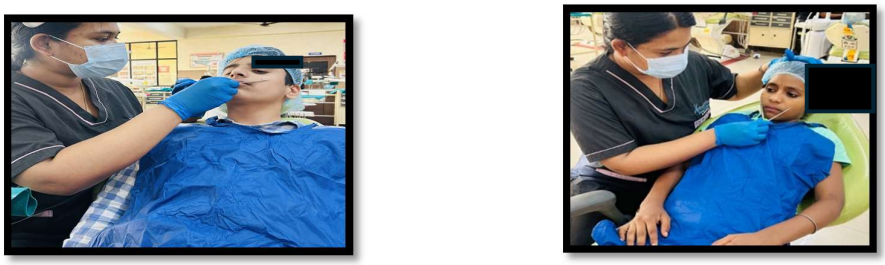

FIGURE 19,20,21& 22: Intraoral examination for Facial index assessment

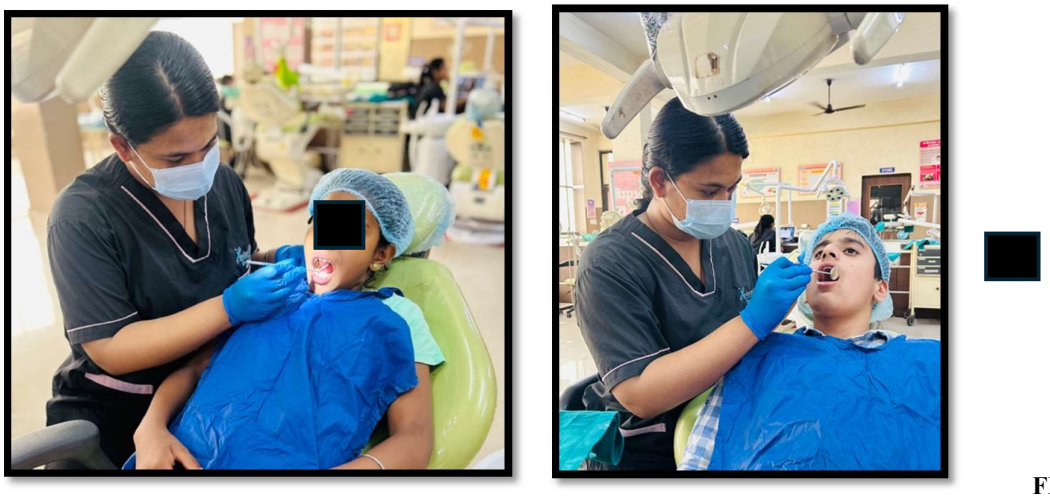

FIGURE 23 & 24: Intraoral examination for DAI assessment

TABLE 2: Evaluation and comparison of DMFT, DAI, and FAI of adolescents in relation to mothers' nutrition during the gestation period using the One-Way ANOVA test

Variable	Mother's Nutrition	Mean	Std. Deviation	F-value	p-value,S/NS
DMFT	**0-2**	6.72	3.526	3.940	0.009 *
	3-5	5.13	3.366		
	6-8	5.10	3.101		
	More than 9	4.74	3.336		
DAI	**0-2**	33.11	7.866	20.670	**<0.001** **
	3-5	28.74	7.244		
	6-8	25.80	5.205		
	More than 9	25.51	5.508		
FAI	**0-2**	165.22	5.219	1.022	0.383
	3-5	164.82	4.080		
	6-8	164.83	2.886		
	More than 9	164.20	2.827		

p ≤ 0.05 – Significant * **p ≤ 0.005 – Highly Significant ****

Graph 1: Evaluation and comparison of DMFT, DAI, and FAI of adolescents in relation to mothers' nutrition during the gestation period using the One-Way ANOVA test

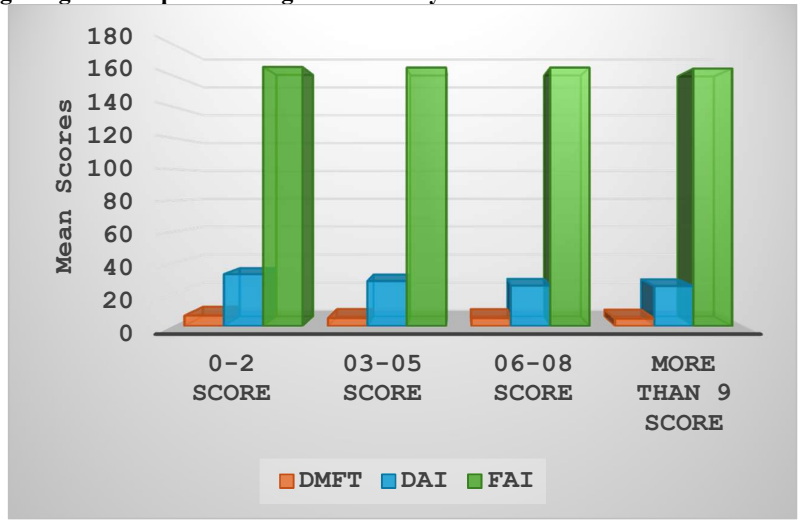

TABLE 3: Inter-group comparison of DMFT, DAI, and FAI of adolescents in relation to mothers' nutrition during the gestation period using the Post Hoc Tukey's Test

Dependent Variable	(I)MOTHER NUTRITION	(J) MOTHER NUTRITION	Mean Difference (I-J)	p-value,S/NS
DMFT	**0-2**	**3-5**	1.585*	**0.031 ***
		6-8	1.616*	**0.019 ***
		More than 9	1.975*	**0.005 ***
	3-5	**6-8**	0.031	1.000
		More than 9	0.391	0.830
	6-8	**More than 9**	.359	0.841
DAI	**0-2**	**3-5**	4.365*	**<0.001 ****
		6-8	7.311*	**<0.001****
		More than 9	7.603*	**<0.001 ****
	3-5	**6-8**	2.946*	**0.001 ***
		More than 9	3.238*	**0.001 ***
	6-8	**More than 9**	0.292	0.985
FAI	**0-2**	**3-5**	0.394	0.922
		6-8	0.386	0.919
		More than 9	1.013	0.395
	3-5	**6-8**	-0.008	1.000
		More than 9	0.619	0.603
	6-8	**More than 9**	0.627	0.547

p ≤ 0.05 – Significant * **p ≤ 0.005 – Highly Significant ****

TABLE 4: Correlation of gender with DMFT, DAI, and FAI in adolescents using One-Way ANOVA test

Variable	Gender	Mean	Std. Deviation	F-value	p-value,S/NS
DMFT	**Male**	5.09	3.347	0.597	0.440
	Female	5.35	3.289		
DAI	**Male**	28.41	6.885	10.353	**0.001 ***
	Female	26.28	6.296		

FAI	**Male**	165.65	3.319	31.595	**<0.001 ****
	Female	163.71	3.573		

p ≤ 0.05 – Significant * **p ≤ 0.005 – Highly Significant ****

GRAPH 2: Correlation of gender with DMFT, DAI, and FAI in adolescents using One-Way ANOVA test

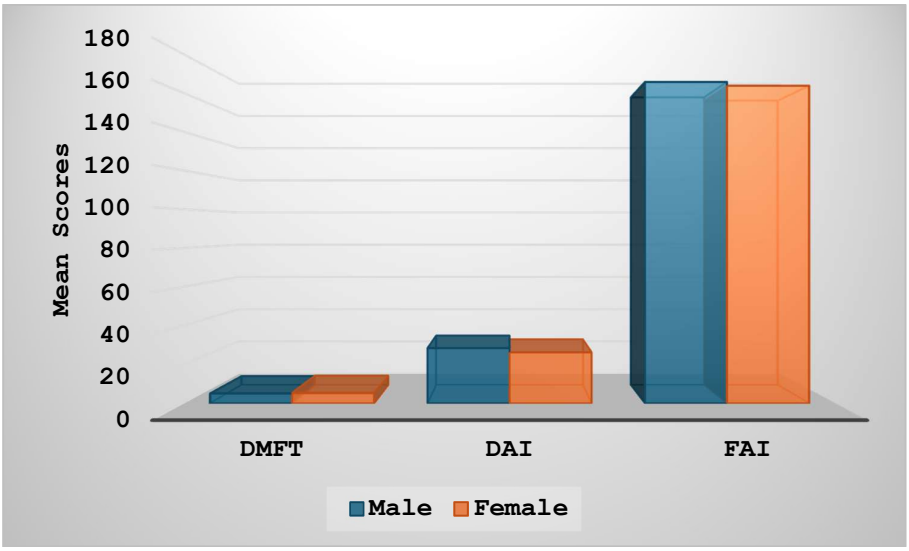

TABLE 5: Correlation of age with DMFT, DAI, and FAI in adolescents using One-Way ANOVA test

Variable	Age group	Mean	Std. Deviation	F-value	p-value,S/NS
DMFT	**10-12 years**	5.23	3.167	0.008	0.929
	13-15 years	5.20	3.524		
DAI	**10-12 years**	25.17	5.761	71.784	**<0.001 ****
	13-15 years	30.46	6.677		
FAI	**Below 12 years**	163.48	3.125	80.487	**<0.001 ****
	Above 12 years	166.44	3.440		

p ≤ 0.05 – Significant * **p ≤ 0.005 – Highly Significant ****

GRAPH 3: Correlation of age with DMFT, DAI, and FAI in adolescents using One-Way ANOVA test

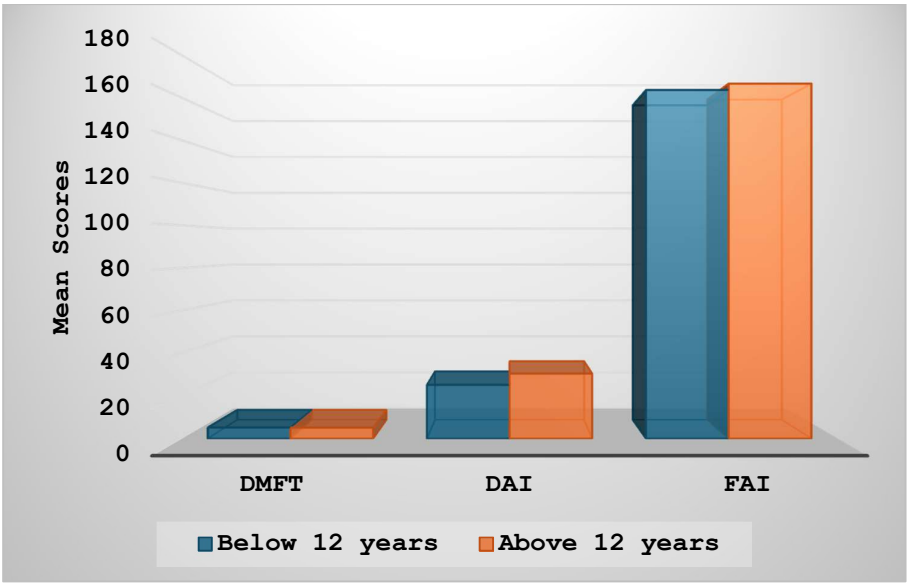

TABLE 6: Correlation of age with DMFT, DAI, and FAI in adolescents in relation to mothers' nutrition during the gestation period using One-Way ANOVA test

Variable	Mother's Nutrition Score	Mean	Std. Deviation	F-value	p-value,S/NS
10- 12 years					
DMFT	**0-2**	6.73	3.035	1.626	0.184
	3-5	5.46	3.024		
	6-8	5.11	3.159		
	More than 9	4.81	3.295		
DAI	**0-2**	26.27	8.022	0.701	0.552
	3-5	25.42	5.657		
	6-8	25.37	5.416		
	More than 9	24.29	5.831		
FAI	**0-2**	159.67	2.944	14.721	**<0.001****
	3-5	162.56	3.257		
	6-8	164.47	2.816		
	More than 9	163.64	2.553		
13-15 Years					
DMFT	**0-2**	6.71	3.788	2.522	0.060
	3-5	4.80	3.680		
	6-8	5.09	3.006		
	More than 9	4.63	3.448		
DAI	**0-2**	36.42	5.296	23.111	**<0.001****
	3-5	32.13	7.156		
	6-8	26.72	4.638		
	More than 9	27.51	4.293		
FAI	**0-2**	167.90	3.736	5.590	**0.001****
	3-5	167.13	3.522		
	6-8	165.62	2.908		
	More than 9	165.14	3.040		

$p \leq 0.05$ – Significant * $p \leq 0.005$ – Highly Significant **

TABLE 7: Correlation of gender with DMFT, DAI, and FAI in adolescents in relation to mothers' nutrition during the gestation period using One-Way ANOVA test

Variable	Mother's Nutrition Score	Mean	Std. Deviation	F-value	p-value,S/NS
Male					
DMFT	**0-2**	6.78	3.577	2.793	0.041*
	3-5	4.97	3.557		
	6-8	4.88	3.090		
	More than 9	4.63	3.153		
DAI	**0-2**	35.37	6.552	16.663	**<0.001****
	3-5	29.59	7.486		
	6-8	26.09	5.387		
	More than 9	26.73	5.515		
FAI	**0-2**	167.81	4.170	6.549	**<0.001****
	3-5	166.12	3.499		
	6-8	165.00	2.776		
	More than 9	164.88	2.772		
Female					
DMFT	**0-2**	6.63	3.547	1.294	0.278
	3-5	5.31	3.167		
	6-8	5.33	3.117		
	More than 9	4.87	3.552		
DAI	**0-2**	29.89	8.608	5.549	0.001**
	3-5	27.81	6.920		
	6-8	25.49	5.024		
	More than 9	24.20	5.251		
FAI	**0-2**	161.53	4.299	4.454	**0.005****
	3-5	163.41	4.227		
	6-8	164.65	3.008		
	More than 9	163.49	2.735		

$p \leq 0.05$ – Significant * **$p \leq 0.005$ – Highly Significant ****

DISCUSSION

The present study demonstrated a significant association between maternal nutrition during gestation and oral health outcomes in adolescents aged 10–15 years. Improved maternal nutrition was associated with lower DMFT and DAI scores, indicating reduced dental caries experience and better dental aesthetics, whereas no significant association was observed with FAI scores.

These findings support previous studies reporting that adequate maternal intake of essential nutrients such as vitamin D, calcium, iron, and folic acid promotes proper enamel mineralisation and craniofacial development, thereby reducing the risk of dental caries and malocclusion in offspring.4,47,73 The inverse relationship observed between maternal nutrition and DMFT scores is consistent with findings by Alammar et al.73 and Alrashdi et al.4, who reported lower caries prevalence among children born to mothers with better nutritional status during pregnancy.

Gender analysis revealed significantly better DAI and FAI scores among females, while age-related analysis showed higher DAI and FAI scores among older adolescents, suggesting that dentofacial irregularities become more evident with growth and development. These findings are consistent with previous reports demonstrating the long-term influence of prenatal nutrition on oral health outcomes.71,73,84,85

The biological basis of these findings may be attributed to the role of prenatal nutrients in odontogenesis and craniofacial morphogenesis. Deficiencies during critical developmental periods may impair enamel formation and skeletal growth, increasing susceptibility to caries and malocclusion in later life.47

Although the cross-sectional design and reliance on maternal recall may limit causal interpretation, the findings highlight the importance of adequate maternal nutrition during pregnancy. Incorporating nutritional counselling and dietary support into antenatal care may contribute to improved oral health outcomes and reduced burden of dental caries and dentofacial deformities among adolescents.4,10

CONCLUSION

This study demonstrated a significant association between maternal nutritional status during gestation and oral health outcomes in adolescents aged 10–15 years. Poor maternal nutrition was associated with higher dental caries experience and greater severity of dentofacial deformities, with a more pronounced effect observed on dentofacial development. In

contrast, no significant overall association was found between maternal nutrition and facial index values.

The findings highlight the importance of adequate maternal nutrition during pregnancy in promoting favourable oral and craniofacial development in offspring and suggest that prenatal nutritional care may contribute to reducing the burden of dental and dentofacial problems during adolescence.

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