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RESEARCH ARTICLE

ASSESSMENT OF PARENTS KNOWLEDGE AND AWARENESS REGARDING ORO-SYSTEMIC LINKS IN CHILDREN: A CROSS-SECTIONAL SURVEY

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Abstract

Aim and Background:A relationship between oral and systemic health is nothing new to us. Most of the general population assumes that systemic health only affects the organs of the body and they are unaware about the ill effects of some medical conditions on oral cavity. The aim of the study is to explore the parents/ guardian's perception regarding the Oro-systemic link in their children.

Methods: This study was conducted among 50 parents/guardians who came along with the children in the Department of Pediatric and Preventive dentistry. All the participants were provided with the study questionnaire which was required to be filled independently. The purpose of the study questionnaire is to gather demographic information before posing targeted questions that gauge participants' awareness and understanding of the connection between oral and systemic health.

Results: In this study,16% of the participants believed that oral health status has any effect on the rest of the body.A positive response was observed on the effect of vitamin and mineral deficiency on child's teeth and gum health (60% yes) and 66% participants felt that overall growth and development of the body is related to the development of dentition.Regarding the effect of medication given to the pregnant woman on child's teeth, stress, obesity, infant feeding pattern, less than 20% positive response were recorded.

Conclusion: We as Pedodontists should educate general public/parents/guardians about Oro-systemic connection because with this we can ensure that the children will adopt healthy lifestyle from childhood.

Clinical Significance: Imparting knowledge regarding Oro-systemic links to patients and their guardian will lead the child to adopt a healthy lifestyle from beginning.

Introduction:-

Former US General **C. Everett Koop** has stated that a person can't have good general health without good oral health. The conception that oral conditions can significantly regulate events elsewhere in the body is not new, but it has gone through a number of looping's across the years. An often-quoted early publication is an 1891 report of Miller titled **"The Human Mouth as a Focus of Infection"**. Miller suggested a role for oral microorganisms or

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their products in the development of a variety of illnesses in sites distant from the oral cavity, including brain abscesses, pulmonary diseases and gastric problems, in addition to a number of systemic infective diseases.[1]

Certainly, oral diseases are a substantial burden globally, impacting individuals and societies in multiple ways. They not only affect oral health and quality of life but also have far-reaching implications for overall health.[2] The relationship between oral health and systemic health is intricate and extensive, particularly among the elderly population. Over 100 systemic diseases have been linked to oral manifestations. These include conditions such as diabetes, cardiovascular diseases, HIV/AIDS, osteoporosis, and autoimmune disorders. Oral health can serve as an indicator or even a contributor to the progression of these systemic diseases and approximately 500 medications can cause oral side effects or manifestations [3,4]common risk factors like smoking, alcohol consumption, and obesity can exacerbate the association between oral health and systemic conditions in several ways. Addressing these issues requires comprehensive public health strategies that promote awareness of the links between oral and systemic health, encourage healthy behaviours, and integrate oral health into primary care and chronic disease management programs. By improving knowledge and prevention efforts, we can potentially reduce the burden of preventable hospitalizations, enhance health outcomes, and improve overall quality of life for individuals.[3]

The evidence linking oral health to systemic health has been accumulating steadily, revealing significant associations between various oral conditions and systemic diseases. Periodontal disease has been found associated with an increased risk of cardiovascular disease, premature, low-birth-weight babies, and respiratory diseases. The current literature already supports a bidirectional relationship between diabetes mellitus and periodontal diseases.[5,6,7,8] Advancements in medical management have led to longer life expectancy and improved quality of life for many individuals. However, these advancements have also created populations with specific oral healthcare needs, particularly among those who are immunocompromised, elderly, or managing chronic health conditions. Certain medications commonly used in these populations can impact oral health and can cause adverse reactions in the oral cavity, such as xerostomia and ulceration leading to increased risk of tooth decay, periodontal disease, and infection[9]

Careful examination of the oral cavity may reveal findings indicative of an underlying systemic condition, and allow for early diagnosis and treatment. The examination should include evaluation for mucosal changes, periodontal inflammation, and general condition of the teeth[10]

The awareness of the general public regarding the impact of systemic diseases on oral cavity or vice versa is important because most of the general population assumes that systemic diseases affect a specific organ without realizing the possible ill effects of various medical conditions and therapies on the oral cavity.

Pediatric Dentists deal with the child and the parents both so imparting the knowledge of Oro-systemic link is equally important because this would go a long way in spreading the awareness among the general population and with this, we can ensure that the children adopt healthy lifestyle right from the beginning.[5]

After carefully searching the relevant literature, there were no studies regarding the awareness of parents regarding the Oro-systemic links in their children. Therefore, the current study aimed at the parents' knowledge and awareness regarding Oro systemic links in children.[5]

Materials and Method:-

The present study was designed as a cross-sectional survey. It was carried out in the Department of Pediatric and Preventive Dentistry, Jaipur Dental College. The Study population comprised of parents/guardians that came along with the child in the department between the time period of December 2023-January 2024. A total of 50 people participated in the study. Each participant was provided with a written questionnaire which was required to be filled and informed consent was also obtained from each participant. The Questionnaire **(table 1)** was framed in a simple language and there were specific questions targeting the awareness and knowledge of the participants regarding the Oro-systemic links.

Table 1:- Study Questionnaire.

1	**Gender**	**M**		**F**
2	**Age**			

3	**Education level**	**School level**		**College level**
4	**Is this your child's first dental visit?**	**Yes**		**No**
5	**Do you think oral health status has any effect on the rest of the body?**	**Yes**	**No**	**I don't know**
6	**Do you think the medications can have adverse effect on the oral cavity?**	**Yes**	**No**	**I don't know**
7	**Do you think the medication given to a pregnant woman can cause harmful effect on child's teeth?**	**Yes**	**No**	**I don't know**
8	**Do you think that vitamin and mineral deficiencies affect child's tooth and gum health?**	**Yes**	**No**	**I don't know**
9	**Do you think infant feeding patterns cause dental caries in children?**	**Yes**	**No**	**I don't know**
10	**Do you think childhood obesity leads to dental caries?**	**Yes**	**No**	**I don't know**
11	**Do you think a person suffering from diabetes is more likely to suffer from gum disease?**	**Yes**	**No**	**I don't know**
12	**Do you think stress could have impact on gum?**	**Yes**	**No**	**I don't know**
13	**Do you think that overall growth and development of body is also related to the development of dentition?**	**Yes**	**No**	**I don't know**

Results:-

At the end of the study, a total of 50 participants completed the questionnaires. A total of 24(48%) participants were males while 26(52%) were females. Out of total participants, 22(44%) were school qualified while 28(56%) were college qualified. 29(58%) were first time visitors to the OPD while 21(42%) were subsequent visitors.

When we talk about the knowledge regarding Oro-systemic links **(table 2)**, less than a quarter of the total participants (16%) believed that oral health status has any effect on the rest of the body. A positive response was observed on the effect of vitamin and mineral deficiency on child's teeth and gum health (60% yes) and 66% participants felt that overall growth and development of the body is related to the development of dentition.

Table2:-Knowledge on the basis of education level and gender of parents.

	Yes	No	I don't know
Effect of oral health on rest of the body	16%	56%	28%
Effect of medicine on oral cavity	18%	60%	22%
Medication given to the pregnant woman and harmful effect on child's teeth	10%	70%	20%
Vitamin and mineral deficiency and child's tooth and gum health	60%	24%	16%
Infant feeding pattern and dental caries	18%	50%	32%

Childhood obesity and dental caries	14%	66%	20%
Diabetes and gum diseases	26%	32%	42%
Stress and gum health	6%	68%	26%
Overall growth and development of body and development of dentition	66%	16%	18%

Table3:-Knowledge on the basis of education level and gender of parents.

Indicators	Responses	Education level				Total		P Value	Ho:Null hypothesis
		College		School					
		No.	%	No.	%	No.	%		
Gender	Female	15	30	11	22	26	52	0.5136	There is no significant difference in education levels of the gender of the parents
	Male	16	32	8	16	24	48		
Is this your child's first dental visit	No	12	24	8	16	20	40	0.8120	There is no significant difference in education levels of the parents in their child's first dental visit.
	Yes	19	38	11	22	30	60		
Do you think oral health status has any effect on rest of the body	Don't know	11	22	3	6	14	28	0.1411	There is no significant difference in education levels of the parents in the response of "Do you think oral health status has any effect on rest of the body?
	No	14	28	14	28	28	56		
	Yes	6	12	2	4	8	16		
Do you think medication can have adverse effect on the oral cavity	Don't know	7	14	4	8	11	22	0.9293	There is no significant difference in education levels of the parents in the response of "Do you think medication can have adverse effect on the oral cavity?
	No	18	36	12	24	30	60		
	Yes	6	12	3	6	9	18		
Do you think the medication given to a pregnant woman can cause harmful effect on child's teeth	Don't know	7	14	3	6	10	20	0.1212	There is no significant difference in education levels of the parents in the response of "Do you think the medication given to a pregnant woman can cause harmful effect on child's teeth.
	No	19	38	16	32	35	70		
	Yes	5	10	0	0	5	10		
Do you think vitamin and mineral deficiencies affect child's tooth and gum health	Don't know	5	10	3	6	8	16	0.6030	There is no significant difference in education levels of the parents in the response of "Do you think vitamin and mineral deficiencies affect child's tooth and gum health?
	No	6	12	6	12	12	24		
	Yes	20	40	10	20	30	60		
Do you think infant feeding patterns cause dental caries in children	Don't know	11	22	5	10	16	32	0.0761	There is no significant difference in education levels of the parents in the response of "Do you think infant feeding patterns cause dental caries in children?
	No	12	24	13	26	25	50		
	Yes	8	16	1	2	9	18		
Do you think childhood obesity leads to dental caries	Don't know	7	14	3	6	10	20	0.8315	There is no significant difference in education levels of the parents in the response of "Do you think childhood obesity leads to dental caries?"
	No	20	40	13	26	33	66		
	Yes	4	8	3	6	7	14		
Do you think a kid suffering from diabetes is more likely to suffer from gum disease	Don't know	13	26	8	16	21	42	0.9985	There is no significant difference in education levels of the parents in the response of "Do you think a kid suffering from diabetes is more likely to suffer from gum disease?"
	No	10	20	6	12	16	32		
	Yes	8	16	5	10	13	26		
Do you think stress could have impact on gums	Don't know	11	22	2	4	13	26	0.1330	There is no significant difference in education levels of the parents in the response of "Do you think stress could have impact on gums?"
	No	18	36	16	32	34	68		
	Yes	2	4	1	2	3	6		
Do you think that overall growth and development of body is also related to the development of dentition	Don't know	4	8	5	10	9	18	0.4763	There is no significant difference in education levels of the parents in the response of "Do you think that overall growth and development of body is also related to the development of dentition?"
	No	5	10	3	6	8	16		
	Yes	22	44	11	22	33	66		

Regarding the effect of medication given to the pregnant woman on child's teeth, stress, obesity, infant feeding pattern, less than 20% positive response were recorded. These findings indicate a very poor awareness regarding the Oro-systemic link.

In addition, no significant difference in the answers were seen on the basis of gender and educational level of the parents (p value>0.05) **(table 3)**

Discussion:-

Sangwan A et al in their survey on Oro-systemic link awareness mentioned that how important it is for a Paediatric dentist to lay emphasis on imparting knowledge regarding Oro-systemic links to parents and patients since this would children to adopt healthy lifestyle from beginning.[5] Their study inspired the current study to check the awareness amongst the parents about the oral and systemic health in their children.

By looking at the results we can say that that the parents had poor knowledge and awareness regarding the connection of oral and systemic health and no significant difference was seen on the level of education amongst parents. **Jokovic A et al** explored parental knowledge of the impact of oral diseases and disorders on the quality of life of their children and concluded that parents have limited knowledge concerning their child however the information provided by the parents was useful even if it was incomplete.[11] **Chalvatzoglou E et al** in their study assessed maternal knowledge about oral health practices for children along with oral hygiene perceptions of mothers during pregnancy in the city of Thessaloniki, Greece, found out that newly-delivered mothers presented with a lack of knowledge regarding mother/caregiver-related risk factors associated with early childhood caries (ECC), the timing of establishing a dental home, and misconceptions about the safety of dental visits during pregnancy.[12] **Sabrina Akl et al** investigated the awareness of patients with major systemic conditions, regarding the link between oral disease and their condition and concluded that patients with major systemic conditions have poor knowledge and awareness (< 50%) of the oral health associations to their condition.[13]

When we talk about the relationship between diet, nutrition and oral health, we know that nutritional factors play an important role in the initial growth, repair and continued integrity of oral tissues and structures. Optimal nutrition during periods of hard and soft tissue development allows oral tissues to reach their potential for growth and resistance to disease. Undernourished child during critical periods of tooth development can have irreversible effects on the developing oral structres.[14] **Liliana HL et al** mentioned that the primary dentition begins to develop after two months of intrauterine life, and the permanent one a few months before birth. Significant nutritional deficiencies during pregnancy can induce malformations in the child and susceptibility to dental caries. Chronic nutritional imbalances can significantly impact dental health in children like late dental eruptions, compromise tooth integrity and increase the frequency of tooth decay. Malnutrition, for example, interferes with enamel formation, leading to hypoplasia and hypocalcification associated with decreased resistance to tooth decay. Classical as well may include essential nutrients for proper tooth development and maintenance for oral health, vitamins A, C, D and minerals: calcium, phosphorus and fluor.[15] **Atasoy HB et al**compare the dental caries prevalence and gingival health status of zinc-deficient children with healthy subjects and they concluded that children with systemic zinc deficiency have caries prevalence rate higher and gingival health poorer compared to their zinc-sufficient counterparts. Many trace elements are known to enter the dental tissues and saliva and to contribute to the development of teeth and inhibition of caries.[16] As a trace mineral, dietary zinc is also important for the mineralization of the enamel and is known to reduce the susceptibility to dental caries.[17,18] Children who live in areas with zinc-deficient soil were found to have a higher prevalence of dental caries and poor oral hygiene scores. Low zinc content of saliva was shown to be associated with a higher frequency of dental caries[16]

Several systemic diseases and syndromes are known to impact periodontal health and that may be included in a differential diagnosis when periodontitis is detected in paediatric patients.[19] Patients with Chédiak-Higashi syndrome exhibits gingival inflammation, early onset periodontitis in primary and permanent dentition.[20] **Madjova C et al** examined the prevalence, symptoms and signs of oral manifestation of DM type 1 in a sample group of Bulgarian children found out that patients with DM had no significantly higher prevalence of dental caries, but rather significantly higher occurrence of plaque, gingival inflammation, bad breath (halitosis) and dry mouth compared to the clinically healthy control group.[21]

Haim-Munk syndrome causes premature loss of all primary teeth by age 4-5; loss of permanent teeth by age 16 and after tooth loss, gingiva returns to healthy state[19,22] Obesity causes Increased plaque index, bleeding on probing, periodontal pocket depth, clinical attachment loss, mouth breathing.[19]

Willershausen et al showed that the children whose weight was normal had significantly less caries in their deciduous and permanent teeth than the overweight children.[23] Whereas **Kantovitz KR et al** could not find any evidence of direct relationship between dental caries and obesity.[24]

Maternal periodontal health can have various outcome on neonatal health like low birth weight, preterm delivery, preterm low birth weight etc.[25] Untreated dental caries in mothers increases the risk of caries development among their children, as maternal transmission and early childhood caries (ECC) has been established. The vertical transmission of Streptococcus mutans, from mother to child, has been well documented.[26] MS, present in children with early childhood caries, is predominantly acquired from mother's saliva.[27]

The diet of the pregnant female can affect the health of the child. A healthy diet is crucial during pregnancy to ensure both the mother-to-be and the unborn child receive adequate nutrients for optimal growth, development, and overall health. **Recommended Dietary Allowances** (RDAs) during pregnancy and lactation are typically presented as absolute figures rather than additions to basic allowances Nutrients of particular importance include folic acid, calcium, magnesium, zinc, and vitamins K, C, B6 and B12. Maternal vitamin D levels during pregnancy are critical for the proper development of the foetal dentition, including enamel integrity. Ensuring adequate vitamin D intake through diet and supplementation, as needed, can potentially reduce the risk of early childhood caries and support overall.[27]

Tetracycline administration during odontogenesis can lead to defects in enamel formation in both primary and permanent teeth. The specific teeth or portions of teeth affected depend on the timing of exposure relative to the stages of tooth development. Early recognition of these effects is important for appropriate management and dental care planning to address any cosmetic or functional concerns associated with enamel defects caused by tetracycline exposure.[28]

Enabulele JE et al did a descriptive cross-sectional study on Tetracycline use in children and knowledge of its oral implications among nursing mothers concluded that despite the side effects associated with use of tetracycline, mothers still administer it to their children with knowledge of oral implication of tetracycline use. Health education aimed at parents and caregivers about the use of tetracyclines and its potential side effects on dental development is crucial for preventing oral complications in young children. By promoting awareness and informed decision-making, healthcare providers can help safeguard dental health and overall well-being in pediatric populations.[29]

Conclusion:-

The results of the study have shown a poor awareness regarding Oro-systemic link amongst parents/guardians. As we have discussed above there are various effects of systemic health on oral health and vice versa. More stress should be laid on the dissemination of knowledge regarding the Oro-systemic link. We as Pedodontists should educate general public/parents/guardians about Oro-systemic connection because with this we can ensure that the children will adopt healthy lifestyle from childhood.

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