

# FLUORIDE SUPPLEMENTS IN PREGNANCY, EFFECTIVENESS IN THE PREVENTION OF DENTAL CARIES IN A GROUP OF CHILDREN

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## SUMMARY

### *Fluoride supplements in pregnancy, effectiveness in the prevention of dental caries in a group of children.*

This clinical, retrospective study intends to evaluate whether the systemic administration of fluoride during pregnancy can reduce caries incidence in a group of paediatric patients, compared to a control group.

84 patients were selected out of a sample of 2000 children (3-15 years of age) and then divided in two groups: TEST Group: 34 patients (16M – 18F, mean age 9.23), whose mothers had taken fluoride during pregnancy; CONTROL Group: 50 patients (23M - 27F, mean age 9) whose mothers had not taken fluoride.

Patients underwent a clinical and radiographic inspection to assess the dfs/DFS value as caries index (decayed or filled surfaces for deciduous or permanent teeth).

**Results:** dfs/DFS value: TEST Group: 3.41, CONTROL group 2.49. The TEST group was further divided in individuals who were administered fluoride only during pregnancy (33%) with a dfs/DFS of 3.14 and individuals who were administered fluoride also after birth (67%) with a dfs/DFS of 3. Caries index (dfs/DFS) did not show any significant differences between the test and control groups. Fluoride administration during pregnancy and postpartum does not seem to have a significant impact on the reduction of caries incidence. More preventive strategies should be investigated to contrast the multifactorial etiology of children caries.

**Key words:** fluoride, caries prevention, pregnancy dietary supplements, systemic fluoroprophyllaxis, caries in children.

## RIASSUNTO

### *Integratori di fluoro in gravidanza, efficacia nella prevenzione della carie dentale in un gruppo di bambini.*

Attraverso uno studio clinico retrospettivo, si è voluto valutare se la somministrazione sistemica di fluoro durante la gestazione abbia determinato una riduzione nella prevalenza della patologia cariosa in un gruppo di soggetti pediatrici rispetto ad un gruppo controllo.

Su un campione di 2000 soggetti fra 0 e 13 anni afferenti presso il servizio di Odontoiatria Pediatrica dell'Università di Roma Tor Vergata, sono stati selezionati 84 pazienti suddivisi in due gruppi: Gruppo TEST: 34 pazienti (16 M 18 F, età media 9,23 anni), le cui madri durante la gravidanza avevano assunto fluoro; gruppo CONTROLLO: 50 pazienti (23M - 27F, età media 9 anni) le cui madri non avevano assunto fluoro durante la gestazione. I pazienti sono stati sottoposti ad un esame clinico e radiografico per valutare l'indice di carie dfs/DFS (superfici cariate su denti decidui e permanenti).

**Risultati:** Valore di dfs/DFS: gruppo TEST: 3,41, gruppo CONTROLLO 2,49. Il gruppo TEST è stato ulteriormente suddiviso in soggetti a cui era stato somministrato fluoro solo durante la gravidanza (33%), il cui dfs/DFS è risultato 3,14 e soggetti che lo avevano assunto anche dopo la nascita (67%) con dfs/DFS pari a 3. L'indice di carie dfs/DFS non mostra differenze significative tra il gruppo test ed il gruppo controllo. Nello studio da noi effettuato l'indice di carie (dfs/DFS) nel gruppo test e nel gruppo controllo non mostra differenze significative. L'assunzione di fluoro anche dopo la nascita non sembra influire significativamente sull'indice di carie.

L'assunzione di fluoro in gravidanza sembra non influire in maniera significativa sulla riduzione dell'incidenza della patologia cariosa. Altre strategie preventive devono essere studiate per contrastare l'eziologia multifattoriale della carie in età pediatrica.

**Parole chiave:** fluoro, prevenzione della carie, integratori in gravidanza, fluoroprofilassi sistemica, carie pediatrica.

## Introduction

Cariou lesions are today one of the most common pathologies in the general (1,2) and paediatric population (3,4).

The high prevalence of carious lesions in the Italian paediatric population (5) suggests that the whole community should be considered at potential caries risk, and as such needs extensive preventive actions (6-8). Fluoride is indicated as one of the most effective means for caries prevention and prophylaxis both topically and systemically. While scientific evidence undoubtedly points to the effectiveness of topical fluoroprophyllaxis in caries prevention, the actual role of systemic fluoroprophyllaxis on the reduction of carious lesions has not been clarified yet. A number of Authors believe that fluoride administration during pregnancy is the first step towards caries prevention (6,9).

This study aims to assess the relationship between systemic fluoride administration during pregnancy and caries incidence in paediatric age. The literature on fluoride use during pregnancy has been reviewed, and a statistical, epidemiological analysis has been conducted on the patients of the Tor Vergata University Paediatric Dental Service of Rome, whose mothers had taken fluoride during pregnancy (test group), compared to a control group.

## Fluoroprophyllaxis

Sufficient evidence proves that the use of fluorides is the most effective tool for caries prevention in school-age children (10).

The main sources of fluoride intake in humans can be divided into: natural and non natural. By natural sources, we mean environmental elements (water, food, air) that convey fluorides to humans. Non natural sources are mainly intended as pharmaceutical fluoridated products that have a topical application, such as toothpastes, mouthwashes, varnishes, fluoridated gels, and fluoride pills.

Systemically administered fluoride is mainly absorbed by the gastrointestinal tract and then distri-

buted to soft and hard tissues and the various bodily fluids, such as saliva, tears, milk, cerebrospinal fluid and plasma (10). Over 86% of fluorides present in the human body are concentrated in calcified tissues (9). This similarity is translated into a linear relationship between the fluoride concentration present in drinking water and hard tissues.

Fluoride interacts with the tooth structure (enamel) both during odontogenesis and after complete dental formation and eruption in the oral cavity. The systemic administration of fluoride during odontogenesis allows the deposit of such mineral in the deepest strata of the forming enamel, and favours the creation of fluorapatite, that is less soluble than hydroxyapatite, more resistant to the acid attacks of the plaque, and more stable as it is formed by a smaller molecule (10).

In the past, the early studies conducted on the fluoridation of drinking waters lead the scientific community to believe that the cariostatic effect of fluoride was essentially linked to its mechanic capacity to integrate with the dental enamel during the early phases of amelogenesis (11,12). Later on, in the mid '90s, it was assumed that the reduction in the incidence of caries in the West countries was mainly due to the daily use of fluoridated toothpastes (6,13). In fact, fluoride owes most of its "anti-carious" properties to a post-eruptive topical action. It is, in fact, known that in order to express its effectiveness, this mineral needs to be present in the quantity of 0.01-0.04 ppm in the enamel-bacterial biofilm interface, and stay in situ during the acid attack (14).

Systemic fluoride administration is effective until the histogenesis process in the dental hard tissues is completed, in fact, after dental eruption, fluoroprophyllaxis can only be performed topically (10).

Systemic fluoride administration is indicated in all children aged between 3 and 6 who live in areas in which the concentration of this trace element in water is < 0.6 ppm, i.e. all areas, with the exception of volcanic ones.

This is the only method of administration to control the dose that is actually taken by this age group: the capacity of children not to ingest significant quantities of toothpaste and/or other elements (e.g. mouthwash) is not certain, or measurable (6).

It is, however, unquestionable that the earlier the beginning of fluoride administration, the better the preventive results at the oral and bone level (6,15).

The topical administration of fluoride through low fluoride toothpastes (550 ppm) is recommended twice a day for children aged between 3 and 6. After 6 years of age, the use of a toothpaste containing at least 1000 ppm of fluoride twice a day is of fundamental importance to prevent caries and may represent the only form of supplementation (6) in children.

## Fluoroprophylaxis during pregnancy

Some Authors consider the systemic administration of fluoride as a further supplement during pregnancy, as it is identified as the first step to caries prevention (9,14).

To this end, fluoride may be supplemented during pregnancy until dental formation is completed through pharmaceutical products, i.e. pills or drops, according to variable doses (0.25 and 1 mg). During pregnancy and breast feeding, mothers should take 1 mg a day. During weaning and afterwards, the intake in children accounts for 0.05 mg of fluoride per day per kilo of body weight: the best results were obtained by dissolving pills in the mouth or water (15). In fact, theoretically, during intrauterine life, the fluoride taken by the mother may work in the pre-eruptive phase, during the amelogenesis of deciduous teeth with a consequent beneficial effect on the newborn's deciduous teeth (16).

A number of Authors have studied the passage of fluoride through the placenta both in men (17-19) and animals (20,21). They agree on the passage of fluoride through the placenta, thus stressing a passive role of the placenta (18). Others believe the opposite (22), while other authors think that both hypotheses are correct, due to fluoride concentration in the blood (6). Fluoride passes through the placenta freely, until it reaches excessively high levels in the mother's blood, and thus triggers this passage (barrier effect) to protect the foetus from excessive doses. The threshold concentration that pushes the pla-

centa to trigger this function is 0.4 ppm of fluoride in maternal blood (23).

A 2006 Review on fluoroprophylaxis during pregnancy (14) revealed that only a few Studies had explored the problem though often with clashing results, that is why it has not been possible to clarify the real effectiveness of fluoridated supplements during pregnancy (14).

More recent studies (6) suggest that fluoroprophylaxis may start from the third month of pregnancy with the administration of 1mg/day to the mother, however, the same Authors indicate that there is a substantial uncertainty about the recommendation of this procedure, because of the lack of solid scientific data on its effectiveness due to the little scientific evidence that is only based on consensus or the clinical experience of experts.

## Methods

Our research conducted through a statistical and retrospective study at the Tor Vergata University Pediatric Dental Service of Rome aimed at evaluating the effects of fluoride administration during pregnancy on the prevalence of carious lesions in deciduous and permanent teeth.

A sample of 2000 patients aged between 3 and 15 and currently undergoing therapies was analysed. 84 patients were selected and divided in two groups, children with high risk factors due to carious lesions, such as possible systemic pathologies (celiac disease, diabetes, etc.) or Baby Bottle Syndrome (BBS) were excluded from the sample:

- TEST Group: 34 patients (16M – 18 F, mean age 9.23 years), whose mothers had taken fluoride during pregnancy
- CONTROL group: 50 patients (23M – 27F mean age 9 years) whose mothers had not taken fluoride during pregnancy.

A questionnaire was administered to learn the following:

- Anagraphical data (first name, last name, and birth date) of mother and child
- Mother's age during pregnancy
- Fluoride intake during pregnancy

- Post-birth fluoride administration to child

Both the TEST and CONTROL groups were later assessed through clinical and radiographic investigations for diagnosis of carious lesions. In order to evaluate the effectiveness of fluoroprophylaxis during pregnancy through the prevalence of carious lesions, we calculated the dfs/DFS index (decayed, filled surfaces, for deciduous or permanent teeth) and the percentage of caries-free individuals in the two selected groups. The TEST group was further divided in individuals who had taken fluoride before and after birth or only during pregnancy.

## Results

The dfs/DFS index result was 3.41 in the TEST group and 2.48 in the CONTROL group (Table 1). The differences in dfs/DFS index in the two groups are not statistically significant.

The percentage of caries-free children was 35.48% in the TEST group, and 28% in the CONTROL group (Table 2).

We conducted another analysis on the test group as regards the dfs/DFS index among children that had only taken fluoride before birth and those who were systematically administered it also after birth: the DFS was 3.14 in the first case and 3 in the second (Table 3).

## Discussion and conclusion

Few clinical studies were conducted on fluoride administration during pregnancy, therefore, on the basis of the literature published so far, there is no clear scientific evidence on the real effectiveness of fluoride supplementation during pregnancy to prevent caries in children (9,14,24).

The results obtained showed a higher percentage of caries-free individuals among children whose mothers had taken fluoride during pregnancy, compared to children whose mothers had not taken it.

The caries index (dfs/DFS) in the test and control groups does not show any significant difference, as

**Table 1** - dfs/DFS index score for Test and Control group.

GROUP	dfs/DFS
TEST	3,41
CONTROL	2,49

**Table 2** - Caries free score in Test and Control group.

GROUP	Caries free (%)
TEST	35,48
CONTROL	28

**Table 3** - dfs/DFS index score within the Test group: fluoride supplementation only during pregnancy or also postpartum.

TEST GROUP	dfs/DFS
Fluoride during pregnancy	3,14
Fluoride during pregnancy and postpartum	3

other studies had pointed out (14,25), also the results of post-birth fluoride intake do not seem to have an important impact on the caries index.

As a consequence, it can be observed from the results obtained in this study that fluoride administration during pregnancy is not significant as regards the incidence of carious lesions.

The WHO Oral Health Programme continues to emphasize the importance of public health approaches to the effective use of fluorides for the prevention of dental caries in the 21st century. Everyone, older than 3 years should be encouraged to brush daily with a fluoride toothpaste. In addition, where the incidence and prevalence of dental caries in the community is high to moderate, or where there are firm indications that the incidence of caries is increasing, an additional source of fluoride (water, salt or milk) should be considered; it is recommend that a community should use no more than one systemic fluoride combined with the use of fluoride toothpastes, and that the prevalence of dental fluorosis

should be monitored in order to detect increases in or higher-than-acceptable levels (26). Caries prevalence in children remain an unsolved problem in all the countries and populations and more preventive strategies should be considered and investigated to contrast the multifactorial etiology of this pathology.

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