STUDY ON FOOD BEHAVIOUR , ORAL HYGIENE AND DENTAL CARIES AMONG URBAN PRIMARY SCHOOL CHILDREN

By

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Abstract

Two hundred primary school children were selected on PPS from Viqarunnisa Noon School and Udayan Bidyalaya of Dhaka city. The Dental caries was prevalent among 60.5 % of the study children. Consumption of candy/chocolate (33.1 %), ice cream (37.2 %) and chewing gum (23.9%) had shown positive relationship with caries. Popular snacks and drinks (53 %) also influenced caries prevalence. Proper oral hygiene through mouth rinse after eating sugary foods was maintained by (46 %) of the study children. This habit along with times of tooth brushing were also contributory to caries. A set of recommendations have been put forward to prevent dental caries through better food behaviour and maintenance of oral hygiene.

Contents

LIST OF FIGURES

LIST OF TABLE

LIST OF TABLES

Introduction :

Caries may be defined as a lesion of acute onset involving all of the erupted teeth and rapidly destroying coronal tissue often a surface (such as proximal surface of mandibular anterior teeth and occlusal surface of posterior teeth, facial surface of maxillary anterior teeth and occlusal surface of posterior teeth) normally immune to decay and healing to early involvement of the dental pulp[1,2]. Teeth affected mostly are maxillary first and second deciduous molar and mandibular first and second deciduous molar.

One of the important cause of pain is dental caries. People from all walks of life suffer from dental caries but school children suffer most.The underlying factor responsible for caries in children may be due to their indiscriminate eating particularly sugary food and not practicing proper tooth brushing.

The prevalence rate is from 3% to 12% in different countries of the world. More than 3.1 percent in England, 5.1 percent in United States and 5.4 percent in Australia[2].It is also known to be influenced by age, sex,race, family, geographical variation, food behaviuor social class and other factors. These factors; dietary habit and social class together with oral hygiene plays most important role for caries development.

Caries begins with the widely accepted premise that dental caries occur only after plaque has accumulated and susceptible to tooth surface in individuals who eat sugar

frequently. The process is slow and all three factors must occure together. Epidemiological corroboration of the theory lacks consistency and as a result, the intrinsic value of oral hygiene practices against the initiation of caries has been vigorously challenged [4].

Plaque, sugar, tooth susceptibility and time are interdependent. Susceptible population with heavy accumulation of plaque remained relatively free from dental caries as long as only small amount of sugar were eaten. A study in 1938 and found the average daily consumption of sugar confectionery preserves and sweets which totaled 2.5 gm/person, which was rose to 244 gm in 1962 but the standard of oral cleanliness remained poor[5].

The diet which was lactovegeterian (i.e. uncooked vegetable and almost sugar free) is less susceptible to caries though the oral cleanliness was poor. They had a mean of 1.1 DMF (Decayed , Missed and Filled) teeth compared with 10.7 in children of similar age with high sugar intake[6,7].

Studies regarding the relationship between caries and oral hygiene may be divided into four approaches:

(1) point prevalences surveys of total caries and oral cleanliness

(II) longitudinal retrospective cleanliness and increment in caries experience,

(III) reported tooth brushing frequency and total caries experience

(IV) prospective studies of improved oral cleanliness and increment in caries experience.

The fundamental difficulty with first three approaches is that good oral hygiene habits may be accompanied by other practices that help to preserve the teeth. Floride has a proven effect against caries and dentrifrices which are becoming an increasingly important method of topical application[8].

Fermented carbohydrate components of the diet are used by cariogenic bacteria and also act as metabolites as they take part in the production of organic acids which demineralise teeth and causes caries. Amongst them sucrose in the major cariogenic food[9]. Sugary snacks or chocolates,ice cream biscuits contain sucrose in a sticky base of other starch are sticks easily to the tooth surface and then causes caries.More the frequency of sugary snacks intake the more will be the exposure of tooth to carious environment. Sweetened comforter full with sugary milk or other cariogenic agent also found to be strongly related to caries[1,10]. Prolong use of sweet vitamin or sweet antibiotic syrup also associated with caries[11].

In two studies in the city of OSLO statistical significant relation was found between positive oral hygiene maintenance and D.M.F. (decayed, missed and filled) surface[12]. Calssifying children into poor and rich class and according to the status of oral cleanliness a significant increase in carious status with the fall in the class or oral cleanliness[13].

Mechanical removal of plaque with or without tooth paste (which is now a day incorporated with floride) plays important role in caries prevention. Bruszt investigated that children, who received vit. D has less caries then who did not[14]. Regular and proper brushing with tooth paste shows less susceptibility of caries but traditional dentrifrices in the village such as charcoal powder is not proved effective in prevention of caries[15].

Although malnourished children had higher caries experience than moderately nourished children , the different caries experience between these two groups were less than the effect of differing levels of floride in the villages water supplies[16].

Bottle feeding is positively associated with high rate caries in urban children[17], Ali, S.M.K.[18]found prevalence of dental caries was 38% in primary school in Dhaka city aged 7 to 12 years in 1978. Like other developing countries, the incidence of caries is increasing in Bangladesh[19]. On the other hand despite the holting of the increasing level in industriallized developing countries (such as Malaysia and Hongkong) and decreasing level in developed countries.

There is polarization of caries to a high-risk minor group[20]. These high-risk groups are found in lower social class or immigrant families where the caries is also confined into these high-risk group need to be clarified. More over prevalence of caries in the school children of affluent families is unknown.

So the present study is designed and conducted to bridge this gap by studying its situation in two urban well reputed schools of Dhaka city among their student. It is expected to give a pen-picture of the state of affairs in the formation of caries among school children of urban area of Dhaka city.

Literature review

In the field of dental caries, very few scientific and organized studies have so far been done in Bangladesh. At different times government organizations and individual researchers have tried to measure the factors of dental caries. In Bangladesh, Ali,S.M.K[21] found that prevalence of dental caries in 5-10 years girls was 37 percent. It was 31.5 percent in 5-10 years boys.

It is revealed that the properties of the different dietary sugars are extensively discussed and sucrose appears to be the most cariogenic[22]. Glucose, fructose and maltose may be only marginally less so,although lactose and galactose are substantially less cariogenic than the others named above. Fresh fruits, vegetables and stable starchy foods as eaten by humans also appear to be of low cariogenicity. It is stated that apart from reducing consumption of sugars there are three other practical methods for caries prevention: plaque control, use of fluoride and the nature of fissure silents.

A survey[23] revealed the following findings,that the proportion of 5 years old children who have caries has declined from 72 percent in 1973 to 10 percent in 1983 and the mean DMFT has decreased from 4.0 to 1.8. In spite of this drop in caries 50 percent of children have active untreated decay in their decidioas teeth. A reduction of about 30 percent in caries of the permanent dentition has occurred the mean DMFT falling from 8.4 to 5.6 during this 10 year period.

A survey was made by Patel[24] to investigate the prevalence of dental caries and periodontal disease among the papua New Guineans and found that rate of diseases were higher. The mean DMFT of the sample examined was 6.3 in 1989 while the mean DMFT was 3.3 in 1978. Changing diet, poor oral hygiene and a chronic shortage of trained dental stuffs are the main causative factor.

In Zambia, Joe Noar and Sara Portnoy[25] investigated the dental health status of school children from two rural schools: three hundred and fifty four pupils aged 13-22 from a secondary school and 121 pupils aged 7-18 years from a primary school. The result shows a high level of dental disease in both samples. More than 37 percent caries, 23.7 percent poor periodental status and 1.31 DMFT while that in the other school are 25.6 percent, 23.1 and 0.39 respectively.

R.Bedi et al[26] studied to determine where an inequality in caries experience existed for permanent teeth between Asian and white pupils of 7 school children (mean age 10.59 year, SE 0.03 years) attending greater glassgow schools in 1989.Five hundred and sixteen children were examined. The Asian population as a whole (n=241, DMFT=0.95), Muslim with English-speaking mothers (ES) (n=67,DMFT=1.24), and non English speaking mother (NES) (n=130, DMFT=0.93), non muslim with ES mother (n = 24, DMFT = 0.38) and NES mothers (n=20, DMFT = 0.90) had a better caries experience of the first permanent molar than that of the white indigenous

population (n=242, DMFT=1.52).

A. Neilson, N.B. Pitts[27] studied on a group of 2854, 1 years old children caries affecting the free smooth surfaces and was found to be a common problem with a total of 2917 lesions observed on molar teeth at the first examination. Most of the lesions involved no macroscopic loss of teeth contour. When the children were examined 2 years later, three quarters of the lesions had either remained static or regressed. Free smooth surface lesions were more likely to develop initially and more likely to progress, in individuals with poor oral hygiene. Free smooth surface caries experience showed a positive correlation with occlusal and approximal decay experience. The number of free smooth surface carious lesion can be used as a predictor of caries risk.

R.F.Wilson and F.P.Ashley[28] studied 84 urban school children, aged 11-12 year to identify caries risk. The predictor variables measured in these children, were baseline caries experience, salivary buffering power counts of salivary streptococcus mutans and lactobacilli, and two estimates of between meal sugar intake. All the predictor variables showed statistically significant correlations with either 2 year or 3 year caries increment. Approximately 25 percent of subjects were identified as high risk individuals on the basis of a 2 year DMFT increment of 5 and above or a 3 years increment of 8 and above.None of the predictor variable achieved the target predictive value of 80 percent either individually or in combination.

A C.Mellor et al[29] examined 9067 children in four different

age groups in eight areas of Britain. The result showed wide differences between the north of England and Scotland and the South of England. The estimates of the population mean DMFT in 5-6 years old ranges from 3.60 in Salferd to 0.77 in Wycombe, while the DMFT in 14-15 years old ranged from 4.82 in Grampian to 2.61 in Wycombe.

Anderson R.J.[30] studied 12 year-old children attending school in central Somerset in 1988.Similar examinations were conducted 6, 9 and 25 years previously,had indicated that the caries experience of the children in those schools was continuing to decrease and at a faster annual rate than previously. The average DMFT was 1.05. It was 5.36, 3.44 and 2.77 when studied 25, 9 and 6 years previously. The major reduction over the last 6 years is the average number of filled teeth per child.

Camara. V.L.[31] comments that in a small minority of cities and towns water fluoridation is practiced and as a result 93 percent of the population needed treatment as a consequence of dental caries. Prevention of caries thus needs treatment of infection and education to avoid it.

Carvalho-J.C et al[32] described the 3 years results of a treatment designed to control occlusal caries on the basis of intensive patient. The sample consisted of 56 children 6-8 year old with their permanent right first molars in different stages of eruption.

In Italy Borea G[33] observed 58 million inhabitants over the

last 15 years and found a decrease in caries incidence: children (6-10 yearsb old) 1970 85 percent, DMFT 4.77, 1980-85: 72 percent, DMFT 3.6. Per capita per year sugar consumption went down from 32.0 kg in 1974 to 28.2 kg in 1983. In Italy water fluoridation is not practiced.

Pieper-K et al[34] examined 669 school beginners and 739 fourth year pupils in Gottingen for caries prevalence and dental hygienic measures. Twenty nine percent of first-year pupils examined had naturally healthy primary teeth, the average DFS was 68 . Only 12 percent of the carious primary tooth surfaces had intact fillings. Carious defects in pupils 26.8 percent had no caries on their permanent teeth, the average DMFS was 3.9.In this age group 60 percent of the carious tooth surfaces had been treated and the components observed were minimal. A comparison of prevalence rates among different schools revealed considerable difference. Average DMFS values at the various school ranged from 2.0 to 5.5.

Pieper-k and Simaitis-k[35] studied 341 children,age 3 to 6, to find out the prevalence of caries and oral hygiene in kindergardens in Bottingen, 59 percent of subjects had healthy natural dentitions, the DFS was 2.3 , which was 40 percent lower than in a comparable study two years before. Oral health had improved differently in the various institutions. The mean DFS was between 1 and 5.1. Only 20 percent of teeth with carious lesions had an intact filling.

In Ondo state,Nigeria Olojugba and Lennon MA[36] showed that

caries had increased in children of both age groups in higher social class families between 1977 to 1983 .

Grenby in 1990[37] found that the nations eating habits are under going major transformation, with a swing away from traditional meals to a huge increase in snack consumption, but very little is known of the nutritional and dental implication of this change. A research involving animal showed the very low cariogenicity of salted peanuts, followed by ready salted and salt and vinegar crisps, extruded maize mixed-starch and prefabricated/fried potato products and chess filled puffs. Other varieties of crisps (cheese and onion with special shapes) proved to be more cariogenic not for short of semi-sweet biscuits in some cases. It is concluded that the severity of the processing undergone by the snacks foods and the nature of the flavoring agent with which they are coated can influences their dental properties.

The World Health Organization and COMA[38] have recommended that free or non milk extrinsic sugars intake should be below 10 % of total energy intake and the COMA report on dietary sugars and human disease has strongly implicated sugar as the main causal factor in dental caries. The-dose response curve for sugar and caries is approximately sigmoid (s shaped). At level of sugar consumption below 10 Kg/person/year the incidence of caries is acceptably low. Beyond 15 kg the incidence increases more rapidly. Floride increases the resistance of teeth to sugar it moves the dose response curve to the right. Thus, when floride is widely available, the acceptable level of non-milk extrinsic

sugars increase to about 15 kg/person/year.

R.D. HOlt[39] has analyzed snacks and drinks regularly consumed by a group of 2139 children. Results confirmed that nearly all children had one or more snacks or drinks on most days. The most popular time for these was mid-afternoon. Sweet biscuits and fruits were the popular snack foods.Diluted fruit squash and milk were popular drinks. Caries, expressed in mean DMFT, increased significantly with increasing number of intakes.

A study[40] on soft drinks, infants fruit drinks and dental health depicted that soft drink consumption in the U.K. has rocketed in the last few years, particularlly in younger age groups with no sign of any sickening off.In fact soft drinks provided as much as 14 to 21 percent of added sugars in the diet of a group of 11-12 year old children in 1986.

W.M. Edgar and D.A.M. Geddes[41] found that sugar free gums are not cariogenic and potentially beneficial in overseeing early caries, while the potential cariogenicity of sucrose sweetened gums can be modified by additives or selected patterns of use. Chewing gum has several properties which are potentially either beneficial or detrimental to the health of the oral tissue. Most of the chewing gums sold throughout the world is sweetened with sucrose and adds to the cariogenic load of dietary carbohydrate. The evidence for this has been based on measurement of plague acidity changes and on micro-radiographic evidence of remineralisation of artificial caries lesion.

Fuller et at [42] found that the important factor in the prevention of dental caries is limiting the number of times in a day that sugar enters the mouth. This can be simply illustrated by using the sugar clock. The effectiveness of this as a technique for teaching 9-11 year old children the importance of limiting frequency of sugar intakes.

In multiple regression analysis DE Vries H.C.B. et al[43] found a significant positive correlation of education of the father with the percentage of the child energy intake provided by healthy foods (r=partial=0.18, n=284, p=0.0001). Significant negative partial correlations were also found of the education of the father (r=0.23) and mother (r=0.29) with the number of decayed, missing and filled tooth surface in the teen-agers . Those results indicate an increased risk of unhealthy food habits in children of less educated parents.

A survey on dental health and dietary habits was made by Bikrhed D and Neiderud AM[44] in 40 Greek immigrant (GI) children, 2-8 years old, born and living in Helsingborg,Sweden. Comparisons were made with 45 Swedish (S) and 54 rural Greek (G) children of the same age. This survey revealed that the caries situation was virtually the same in the GI and the S group, where the primary teeth were caries-free in 31-33 percent, mainly children 2-3 years old. The G group had a higher incidence of decayed and filled tooth surfaces in both primary and permanent teeth than the other two groups and only 15 percent were caries-free in the primary teeth. The (S) group had the lowest gingival bleeding

index. The distribution of the mutans streptococci and lactobacilli counts in saliva did not differ significantly between the three groups, except that the proportion of (GI) children with not detectable mutans streptococci was lower in either the (S) or the (G) group. The tooth brushing frequency was highest in the (S) group, followed by the (GI) group. Approximately 80 percent of the (S) children who brushed their teeth used a fluoride toothpaste compared to 50 and 55 percent respectively in the (G) and the (GI) group. The intake frequency for 5 out of 6 per selected snack food items was highest in the (G) group. The carbohydrate content of the diet, including sucrose was approximately the same in the three groups. Thus the dental health and dietary habits of the Greek immigrant and the Swedish children were generally very similar, while the Greek rural children showed a less favorable cariologenic status.

Olsson[45] surveyed on 200 children in Private school in Addis Ababa. The increase in cari es experience was paralleled the increase in sugar consumption in Ethiopia. That rose from 1.2 Kg / person per year in 1958 to 4.2 Kg / person per year in 1974. He also reported that caries experience was statistically significantly higher in persons using sugar in tea or coffee (2.2 DMFT) compared with these who did not (1.7 DMFT)

Walsh Lj and Seow WK[46] reported that Sucrose is recognized as the most cariogenic carbohydrate. However, other simple sugars may act as substrates for cariogenic micro-organism. Predominant aetiologic factors of rampant caries was prolonged intake of

mineral supplements which contained the disaccharide lactose. The principal caries risk factors include drug induced xerostomia and prolonged contact time with the substrate in a retentive form. Chemical analysis of the products revealed the presence of lactose together with starch or glucose.A strategy for preventive management prior to restorative therapy based on clorhexidine and fluoride-containing products was followed.

In Iceland, a survey[47] in 1987 revealed that 45.8 percent of the children were caries free and the prevalence of caries had a mean DMFT 2.4 and a mean DMFS 3.3. A dietary questionnaire aimed at discovering the frequency of sugar consumption per week revealed a threshold value of 30 instances consumption of sugar intake per week above which caries prevalence increased markedly. Some of this sugar is consumed in pediatric medicines,particularly antibiotics and anti-asthmatics, which are widely used in Iceland. [Caries prevalence (DMFS) for children taking such medicines regularly was 3.0 compared with 2.1 for remaining children ($p < 0.05$). Those children who took fluoride tablets regularly had less caries (mean dmft 1.1) than those who used fluoride tablets irregularly or not at all mean DMFT 2.8 ($p < 0.001$)]. Samples of saliva from the dorsum of the tongue were taken for determination of number of streptococcus mutans and lactobacilli. High bacterial counts were strongly associated with caries.

Vidal and Schroder U[48] studied seventy three 3-6 year old pre school children from Latin American countries living in Malmo

were examined in order to evaluate their oral health status. The children had on average 3.5 ml DMF teeth and 4.9 DMF surfaces. Forty one percent were caries free. Oral hygiene was satisfactory in 25 percent of the children. Regarding dietary habits, 41 percent of the children had more than two unsuitable intakes per day. Night time use of a nursing bottle with sugar containing beverage was reported for 30 percent. The mean DMFS values differed significantly between children with and without S. mutans and lactobacilli in their saliva. Oral health status deviated markedly from the total group of 3-6 years old in Malmo, which might be explained by differences in cultural background and the ability to speak and understand Swedish. In conclusion, the Latin American pre-school children and their families should be regarded as a risk group for caries and gingivitis and consequently be subjected to special preventive dental care.

Vipe holm[49] showed that consumption of sticky sugar containing between meal products can be associated with high caries activity . Another important result from this study is that there is a great variation in the caries development between different individuals, for example among those who consume 24 toffees a day. There are many substitutes available on the European market today, both non caloric and caloric, which have a low or even no cariogenic potential. Even if some of these products have economic, technologic and toxicologic shortcomings, sugar substitution is an important part of the caries prevention.

Ripa 1978[50] have suggested that prolonged bottle feeding of

human infant with bovine or formula milk may be responsible for caries development.

Ojofeitine et al[51] reported that the caries prevalence of 10 to 13 year old children attending fee paying schools was significantly higher than that of 120 children attending non-fee paying schools in Nigeria. The frequency of consumption of sweets, biscuits and cakes was much higher in the children attending the fee paying schools.

Zitzow R.E[52] had stated that Eskimos living on their natural diet have low caries experience but their dental health declined rapidly after exposure to a westernized life style including a high sugar western diet.

Ismail et al[53] conducted a large cross-sectional study in USA and looked specially at the relation between the consumption of soft drinks and caries experience. Analysis of data from 3194 children aged 9-29 years revealed significant positive association between frequency of between meal consumption of soft drinks and high DMFT scores.These association remained even after accounting for the reported concurrent consumption of other surgery foods and other confounding variable.

Normando AD and DE Araujo IC[54] carried out an epidemiological study of 103 schoolchildren from Sirituba island, Absetetubs. Para, Brazil. The mean values found for DMFT and DFT were 6.5 and 5.4 respectively. Although the region is very primitive,

this high prevalence may be linked to several factors. Among which is the urban influence,mainly ;through the use of sugar on food habits in such a way as fundamentally to alter the diet of the amazonian population.

Birkhed D et al[55] analyzed sugar consumption in relation to dental caries in Sweden from 1960 to 1985. Sugar consumption is based on official statistics from the National Swedish Agricultural Board and is expressed in grams per person per day. Over this quarter century total sugar consumption decreased approximately 5 percent from 116 to 110 g/person/day . A shift occurred from direct consumption to indirect (sugar used by the food industry), the former decreasing from 76 to 50 and the later rising from 40 to 60 g/person/day. Available epidemiological data on dental caries in children from the National Swedish Board of Health and Welfare indicated that the frequency of caries decreased dramatically from 1960 to 1985 though comparable data were difficult to obtain for the whole 25-yr period.The conclusion from this study is that these changes in caries prevalence in Sweden cannot be attributed to a corresponding decrease in the per capita consumption of sugar and sugar containing products. On the contrary,the intake of some products traditionally related to dental caries, such as candy and soft drink increased during 1960-1985.

Holt et al[56] studied a 555 children aged 1-5 year from Camden in London where the parents were asked whether or not they

brushes their childs teeth each day.Amongst them, 295 children (53 % of the total study population) were reported to have daily tooth brushing, 84 % of these children were caries free compared with 89 % among those who did not clean daily.

Tucker et al[57] reported that increment in caries experience was 4.3 DMF teeth in those who brushes their teeth at least twice daily compared with a mean of 4.9 DMF teeth in those who brushed less frequently. The difference was significant ($P<0.05$).

In Denmark Petersen P.E[58] studied 212 children and their parents responded to self-administered questionnaires.Moreover, information on DEFS and DMFS was collected from the epidemiologic recording systems for the PDHS (Public dental Health Service) with regard to dental caries, 98 percent of the parents were aware of the harmful effect of sugar and 88 % knew about the role of bacteria. The causal effect of bacteria in relation to periodontal disease was stressed by 81 percent. Most of the parents (93 %) believed that the dental diseases are preventable by means of proper oral hygiene habits, restriction of sugar and sweets and the use of oral hygiene habits, restriction of sugar and sweets and the use of fluorides. The high level of dental knowledge among the parents was related to information given by the PDHS. Tooth brushing at least twice a day was performed by 88 percent of the children and most used fluoridated tooth paste. Practical support to the children was given by 45% of the parents and 55% checked the teeth. On the daily basis, the children had healthy foods like vegetable fruits

(87%) and milk (89 %). Again 45 % of the children consumed sweets on a specific week day.

Van-Nieuwenhuysen-JP et al[59] studied a sample of 3,237 children aged 5 to 21 are described in relation to some objectives of the WHO program. The prevalence of caries is high in the samples as 31.5 percent of the children aged 5 to 6 are free of caries (according to the WHO objectives, 50 percent of the children aged 5 to 6 should have no caries) and the mean number of decayed, missing and filled permanent teeth (DMFT index) in children aged 11 to 12 is 6.6 (The DMFT should be less than or equal to 3). The frequency of tooth brushing is distributed as follows: 23 percent of the children brush their teeth once a week or less, 46 percent brush their teeth once a day , and 31 percent brush their teeth twice a day or more. The purpose and frequeency of the consultations at the dentists office have been examined. Fifteen percent of the children never consult the dentist, 44 percent consult dentist, 44 percent consult dentist in case of toothache, and 41 % go to the dentist office for screening or control. Only 3.2 percent of the children use regularly and appropriately fluoride tablets. Since the variance of the results is large, it is difficult to distinguish explaining variable or of determinants. However,the data indicate that social groups show differences in DMF indices as well as in the behaviours associated with dental hygiene and prevention.

A study was done by Normark S. et al[60] in 1982/83 as an oral health baseline for a comprehensive health project involving

primary school children in rural areas of Tanzania . A number of 399 standard two pupils with a mean age of 10.9 yrs were dentally examined and interviewed using closed questions. Interexaminer reproducibility for caries was 99 percent, inter-interveiwer reliabilities for population correspondence were between 81 percent and 100 percent. DMFS and DEFS was 1,1 for the 92 percent brushing their teeth daily and 1.9 for children brushing once a week or less. The amount of plaque calculus and gingivitis showed no relation to brushing if it was performed more than once a week. The effect of using chewing sticks or plastic toothbrushes was identical. Children eating cakes, biscuits or sweets at least three times a day seemed to have more caries than the rest, DMFS and DEFS being 1.5 and 1.1 respectively.

A survey of 60 pre-school children both from Anglo-Saxon and Lebanese backgrounds conducted by Stacey MA[61] collected detailed information on subjects, oral health status and dietary and feeding habits. Lebanese subjects had significantly higher caries experience (mean dmgs = 4.88) than Anglo-Saxon subjects (mean DMFS = 0.56). Subjects from the different backgrounds varied significantly also in the frequency of exposure to cariogenic agents and health practices. In each situation lebanese children were exposed to higher risk factors than Anglo-Saxon children. Nothwithstanding the association between variables, the best single predictor of variance in caries experience of subject, explaining 23 per cent of the variance of DMFS, was the mother's levels of education. Culturally relevant health

education programmes need to address the specific requirements of high risk groups.

Morehead J.E[62] indicated that children who complied with brushing 70 percent of the sessions had a significantly lower caries increment.

Kidd, E.A.M.[63] comment that in controlling caries teeth where S-mutans are the predominant causes, chlor-hexidine has a role to play in the management of patient with a high level of disease. S-mutans is not found along in association with caries. Species of lactobaccilli and Actinomyces viscoses can also contribute to the carious process.

A research[64] depicted the following findings:

1) The dft index for children aged 1 year to 6 years was lower than that of 10 years age.
2) The DFT indices according to each feeding group were 8.86 in the bottle feeding group, 7.51 in the breast feeding group and 6.77 in the mixed feeding group.
3) The group in which the weaning period was late showed a significantly high DFT index.
4) The DFT index of the group taking beverages containing sugar before going to bed was significantly higher than that of the group without doing this.
5) The group of patients aged 2 years to 5 years who had between meal snacks more frequently showed a high DFT index.
6) The irregularity of the between meal eating times caused a high tendency toward caries occurrence.
7) The group having between meal snacks while playing showed a

significantly higher DFT index than that of the group having it at a table and not playing

8) No relation was observed between the frequency of tooth brushing and the DFT index.

Mirone.M et al[65] has analyzed epidemiological survey of dental caries of 937 middle school students in Gravina. Inthose young subjeects deental decays percentages DMFT were evaluated and compared to age and oral hygiene. They found that oral hygiene had been expressed with values ranging from 1 to 3 the point 1 showed the best situation and 3 the worst.

Sicilla.A et al[66] comment that the individuals who visited the dentist regularly for dental prophylaxis presented the lower caries rate and perio-dental treatment needs the fewer tooth loss and also important reduction in DMFT score. Similar observation has been made in the individuals who brush their teeth frequently or with a correct technique-their rate of caries was also low.

Turabian J.L[67] studied the oral hygiene of patient between 7 to 14 years old from health centre in Toledo. Out of 304 children bad dental care, frequency of tooth brushing with fluride tooth paste less then once per day and daily consumption of chocolate and sweet was found in 83 percent. Caries were diagnosed through inspection in 92 percent of the patients. Seventy three percent reported washing their teeth only occasionally or never, 40 percent consumed sweets daily, 53 percent had never visited the dentist, and 50 percent had not received preventive care for dental disease. These results indicated a precarious state of

dental health in Spain.

In a sample of 5th graders to evaluative survay[68] on efficacy of too mativational method was conducted in France. The data showed marked improvement of dental caries after the both types of motivation.

Mccauley et al[69] found that poor oral cleanliness were accompanied by an increase in the total caries experience. The results of the study had seen that the greatest increase was found in the youngest children (3-4 year old) group and smallest increase in the oldest subjects (12-14 year old) group.

Kleemola kujala and Rasanen[70] studied 543 children aged 5.9 and 13 years. They were divided into three groups according to their plaque indices and sugar consumption assessed by a 24 hour recall method.Caries experience was expressed as the proportion of tooth surface examined which were found caries or filled. The result suggested that when oral hygiene is poor even a relatively low total sugar consumption can promote decay in caries, susceptible primary and young parmanent teeth. The association between the amount of plaque and dental caries was statistically significant at all levels of sugar consumption. With increasing total sugar consumption the risk of caries increased significantly only when oral hygiene was simultaneously poor.

Hypothesis :

(1) School children aged 7-12 yrs in Dhaka city have dental caries

(2) There is close relation between food behaviours and Dental caries

(3) There is association between oral hygiene and dental caries

Objectives of the study :

(1) To undertake prevalence survey of dental caries among selected urban primary school children of Dhaka city

(2) To describe the socio-economic characteristics of the study school children in order to assess the impact of food behaviour on dental caries

(3) To ascertain the relationship between Oral hygiene and Dental caries

(4) To recommend appropriate preventive measures of dental caries for urban primary school children

The expected out come :

The study shall give an insight into the epidemiology of dental caries among school children in Bangladesh, Its cause, nature and behavioural interaction of food . The pain full mouth condition may be an out come of relationship with the dietary practice, indiscriminate use of sugar in frequently consumed food and improper brushing of teeth.

The research findings will be newer, knowledge on food behaviour and its causal effect of caries in urban affluent school children of Dhaka city.

The study finding may be used in planning prevention of cariogenic factors including appropriate dietary practices for urban school children.

Methodology

The study was divided into three component parts, namely (a) survey on dental caries (b) Food consumption survey and (c) Socio-economic survey. The food consumption survey collected data on the food behaviour of the selected samples. The socio-economic survey focused on the socio-economic conditions of households of the study subjects. Data on dental caries was collected by examination of dental condition of the study subjects. The whole study was prospective in nature.

Selection of Study Location :

The two locations were selected purposively in Dhaka city for some definite reasons, such as homogeneity of socio-economic status, availability and co-operation of the people to participate in the study. The selected schools are Viqarunnisa Noon School and Udayan Bidyalaya.These locations were visited between first June 1993 and 30th September 1993 at convenient working period of the schools.

Sample size determination:

A sample was drawn allowing standard error 5 % , using 37.8 % prevalence of dental caries and with 95% confidence limit. Thus the sample of 7-12 years children was calculated by using the following formula.

$S = [n /1 + \{ n / N \}] = 200$

where S= expected sample size (when N < 10,000)

n = expected sample size (when N > 10,000).

i.e. $n = Z^2PQ / d^2$ where Z = 1.96, d = 0.05 (precision)

N = 450 (population).

Sampling :

The investigator of the study had an initial discussion with Principals of the selected schools. Thereafter based on that discussion, initial students list aged 7-12 years were supplied by the office of that school. According to probability proportion to sample size (PPS) 101 boys and 99 girls were selected for the present study.

Questionnaire design :

Three sets of questionnaires were used for the study.They were dental caries survey form, the dietary form and the socio-economic survey form. These questionnaires were tested, modified where necessary and standardized for data collection.

Survey components :

Determination of Dental caries : Every selected child (7-12 years age) was examined by the author. The examination was done by using dental prove, mirror and some times using tongue depressor,in sufficient light. The oral lesion was observed and findings were recorded in the questionnaire. Soft deposit, bad breath and cavity in the teeth was noted carefully.

Dietary: The dietary consumption pattern of various foods such as Rice, Bread,`` Muri'', sugar, Vegetables, Fish, Meat,pulse, milk, egg, fruits, snack food like sweet biscuits, crisps,cheesy biscuits, fruit squash, fruit juice, fruit syrup, chocolate, ice cream, chewing gum and ``chanachur'' by the children in pervious 24 hours were recorded. The survey forms were distributed to the mothers of the children and filling up of the same, applicable for the mothers. Original weight, dressed weight,boiled weight,

cooked weight, fried weight and weight of edible parts of the food items were also noted. Weight of different states of food items were converted in gram by using weighing scale. Standard , cup, bati, pot and spoon were also used. Weight of edible part and calorie of food items were estimated by using conversion factors[21]. Reliabililty and validity test was done by taken 24 hours dietary recall record done for 7 days by the parents of the chilldren in at least 10 percent of the children. Ratio of reliability was found to be 1 (no difference was found).

Socio-economic Assessment:

In questionnaire informations were recorded by parents on family structure, age, occupation,literacy income etc. These forms were returned to the researcher through the children.

Scoring :

Dental caries factors were expressed in quantitative terms for establishing relationships between Nutritional and Dental caries. The factors coming out in quantitative forms were given arbitrary scores for calculating an overall score of dental caries. The details of point allocations as follows :

A. Dental condition (70 points):

A total of 70 points allocated for dental condition of them 60 points were reserved for carious teeth (10 points for each carious teeth and 10 point for caries free).

Consumption of carbohydrate rich Food (60 points):

A total of 60 points were allocated for CHO rich food of them 10 points were reserved for breakfast,10 points for mid-morning,10 points for lunch, 10 points for mid-afternoon, 10 points for supper and 10 points for at bed time.

Consumption of protein rich food (60 points):

Ten points were reserved for each breakfast, mid-morning, mid-afternoon, supper and at bed time.

Consumption of Fat (60 points):

Ten points were reserved for each breakfast, mid-morning, lunch, mid-afternoon, supper and at bedtime.

Variables of the study : Variable of the study subject were age, sex, family size, education of parents, occupation, household monthly income, breast feed, bottle feed, breast feed in times per day, bottle feed in times per day, breast feeding period, caries in teeth, knowledge of parents about caries, carious teeth, filled teeth, missing teeth, complain, treatment, carious foods such as chocolate, ice cream, chewing gum, sweet biscuits, fruit, crisps, other sweet, cheesy biscuits, milk, fruit squash, fruit juice, fruit syrup ,fat ,carbohydrate and protein rich food etc.

Data analysis:

Before finalisation of the data for computer entry, each questionnaire was cross-checked for final editing. After completion of necessary coding and editing, the analysis was undertaking using SPSS software package, EPI Info and Harvard graphics. The output was then presented in figures and tabular form on the basis of frequency distribution.

RESULT

Fig 1 shows the age distribution of the study subjects. Mean ± SD of age was 8.92 ± 1.136. Mode, median and range were 8 yrs, 9 yrs and 7-12 yrs respectively.

Fig 2 shows the family size of the study subjects. Mean ± SD of family size was 4.76 ± 1.273. Mode median and range were 4,4 and 3-9 respectively.

Fig 3 shows the educational level of parents of the study children. Only 1.5 percent of father completed primary level of education whereas 6 percent of mother completed primary level of education.Secondary education of father and mother were completed by 5 percent and 39.0 percent respectively. About 45 percent and 48.5 of father were graduate and post graduate whereas mother were 26.5 and 28.5 percent respectively.

Fig 4 presents percent distribution of the households by monthly income. Only 1 percent of the households had monthly income upto 2000 taka. More than 5 percent of the households had income between 2001-5000 taka per month. About 45 percent of the households had income between 5001-10,000 taka per month. More than 48 percent of the households had income between taka 10,000 and above per month.

Fig 5 reveals the distribution of the children by sex. More

than 50 percent of the children were male and 49.5 percent were females.

Fig 6 shows the percent distribution of children by carious teeth About 40 percent of the children were caries free and 60.0 percent were carious tooth.

Fig 7 shows the percent distribution of both caries free and carious children by sex. More than 21 percent boy and 18 percent girl were caries free whereas 29 percent boy and 31.5 percent girl were caries tooth.

Fig 8 shows the carious teeth by upper left and right side.It was observed that 2 percent and 1 percent of central Incisor on left and right were carious teeth, Lateral incisor had 2.5 percent and 1 percent, Canine had 4 percent and 2.5 percent, 1st premolar had 25 percent and 21 percent, 2nd premolar had 30 percent and 22.5 percent and 1st Molar had 6 percent and 4 percent by left and right side respectively.

Fig 9 shows the carious teeth by lower left and right side. It was observed that 7 percent and 5.5 percent of Canine by left and right side were carious teeth. First premolar 23 percent and 24 percent, 2nd premolar 26 percent and 25.5 percent and 1st Molar 25.2 percent and 25.2 percent by left and right side respectively.

Fig 10 shows the filled tooth by upper left and right side. It was observed that 1.7 percent and 1.7 percent of central Incisor, 1.7 percent lateral and 1.7 percent Canine, 2.5 percent and 4.9 percent first premolar,4.5 percent and 2.5 percent second

premolar and 1.8 percent and 2.4 percent first molar had carious teeth by left and right side respectively.

Fig 11 shows the filled teeth by lower left and right side. It was observed that 4.1 percent and 1.7 percent of 1st premolar, 5 percent and 4.1 percent of second premolar and 3.2 percent and 4.2 percent first molar had filled teeth by left and right side respectively.

Fig 12 shows the missing tooth by upper left and right side. It was observed that 94 percent and 94.5 percent of central Incisor, 94 percent and 94.8 percent of lateral incisor, 58 percent and 59 percent of canine, 40 percent and 40 percent of First premolar and 38 percent and 19 percent of second molar teeth were missing by left and right side respectively.

Fig 13 shows the missing tooth by lower left and right side.It was observed that 98 percent and 98 percent of central Incisor were 98.5 percent and 98 percent of lateral incisor, 30 percent and 58 percent of canine, 49 percent and 48.5 percent of first premolar and 30 percent and 29 percent second premolar were missing by left and right side respectively.

Fig 14 shows the percent distribution of energy,protein,fat and CHO intake of caries free and having caries children.It was observed that intake of CHO of caries free and carious tooth children contributed up to 80.42 percent and 85.7 percent of energy. Intake of protein and fat of caries free and caries tooth children were 9.58 percent, 10 percent, 6.6 percent and 7.7

percent respectively.

Table 1 reveals 95% confidence limits by caries free and caries tooth children. The caries free children were presented by 39.5 percent confidence limit of 28-72 to 50.28. The carious tooth was found in 60.5 percent of the children with confidence limit of 51.79 to 69.20.

Table 2 compare Dental caries by sex.More than 21 % of caries free boy compared with 18% of caries free girl. Proportion test showed that two groups are non significantly different (P>0.05). Twenty nine percent of caries tooth boy compared with 31.5% of caries tooth girl by proportion test showed that no significantly difference (P>0.05).

Table 3 shows the relationship between Dental caries and educational level of mother. The estimated chi-square with 2 degree of freedom was found to be 6.61. This value is significantly different at the 0.05 level ($p < 0.05$). This implies that there was a association between dental caries and educational level of mother.

Table 4 shows the relationship between knowledge of parents about prevention of caries and Dental caries. Only 10 percent of the children were found to have caries teeth whose parents had knowledge about prevention of dental caries. On the other hand parents of 50.5 percent of the children had no knowledge about prevention of dental caries. The calculated value of corrected chi-square with 1 degree of freedom was found to 46.This value is

significantly different at the 0.01 level ($p < 0.01$) which implies that there was a association between Dental caries and knowledge of parents about prevention of caries.

Table 5 shows percent distribution of caries tooth children by their dental problem. The highest frequency 66 (54.5%) were presented by pain. Infection, Bleeding and others were presented by 3.3% , 08% and 6.6% respectively and 34.7 percent of carious tooth children did not have problem during examination.

Table 6 presents percent distribution of caries tooth children by treatment. More than 68.5 % of caries tooth children did not take any treatment.More than 4 % of them had undertaken florid / Zinc chloride / Jell . More than 8 percent of the had undertaken Zinc oxide / Glass Ionomar / Permanent filling i.e. modern medical treatment. The rest 1.1 percent of caries tooth children had taken treatment from other sources.

Table 7 shows the degree of association between dental caries and breast feed.The value of corrected chi-square with 1 degree of free-dom is 0.07. This value is not significantly different ($P > 0.05$). This implies that there is no association between dental caries and breast feeding.

Table 8 shows compares caries free children with caries tooth children by times of breast feed per day. It appears from the table that 38 percent of caries free and 38 percent of carious tooth children had breast feeding 3-6 times. More than 11.3 percent of caries free and 9.4 percent of carious tooth had 6-12 times breast feeding. Fifty percent of caries free and 51.9

percent carious tooth children had breast feeding on demand.

Table 9 compares caries free children with caries tooth children by breast feeding period in month. It appears from the table that the range of breast feeding period was 3-24 month. This range consist of 7 groups. These were 3,5,8,12,16,18 and 24 month. Proportion of caries free and caries tooth children for each groups were not significantly different at 0,.05 level ($P>0.05$).

Table 10 shows the degree of association between dental caries and bottle feeding. The value of corrected chi-square is 70.85. This value is highly significant at the 0.001 level i.e. ($P<0.001$). There was a association between dental caries and bottle feeding.

Table 11 shows the degree of relationship between Dental caries and consumption of chocolate, Ice Cream and Chewing gum. The estimated chi-square with 3 degrees of freedom is 109.8. This is highly significant at the 0.001 level which implies that there was a strong relation between Dental caries and consumption of chocolate, Ice Cream and Chewing gum.

Table 12 shows the relationship between dental caries and consumption of popular snack and drink. The estimated value of corrected chi square with 1 degree of freedom is 53.03. This value is highly significant at the 0.001 level ($p < 0.001$). This implies that there was a association between dental caries and consumption of snacks and drinks.

Table 13 shows the degree of association between dental

caries and mouth rinse after eaten chocolate, ice cream and chewing gum. The value of corrected chi-square is with 1 degree of freedom is 98.29. This value is highly significant at the 0.001 level ($P<0.05$). There was a association between dental caries and mouth rinse after eating chocolate, ice cream and chewing gum.

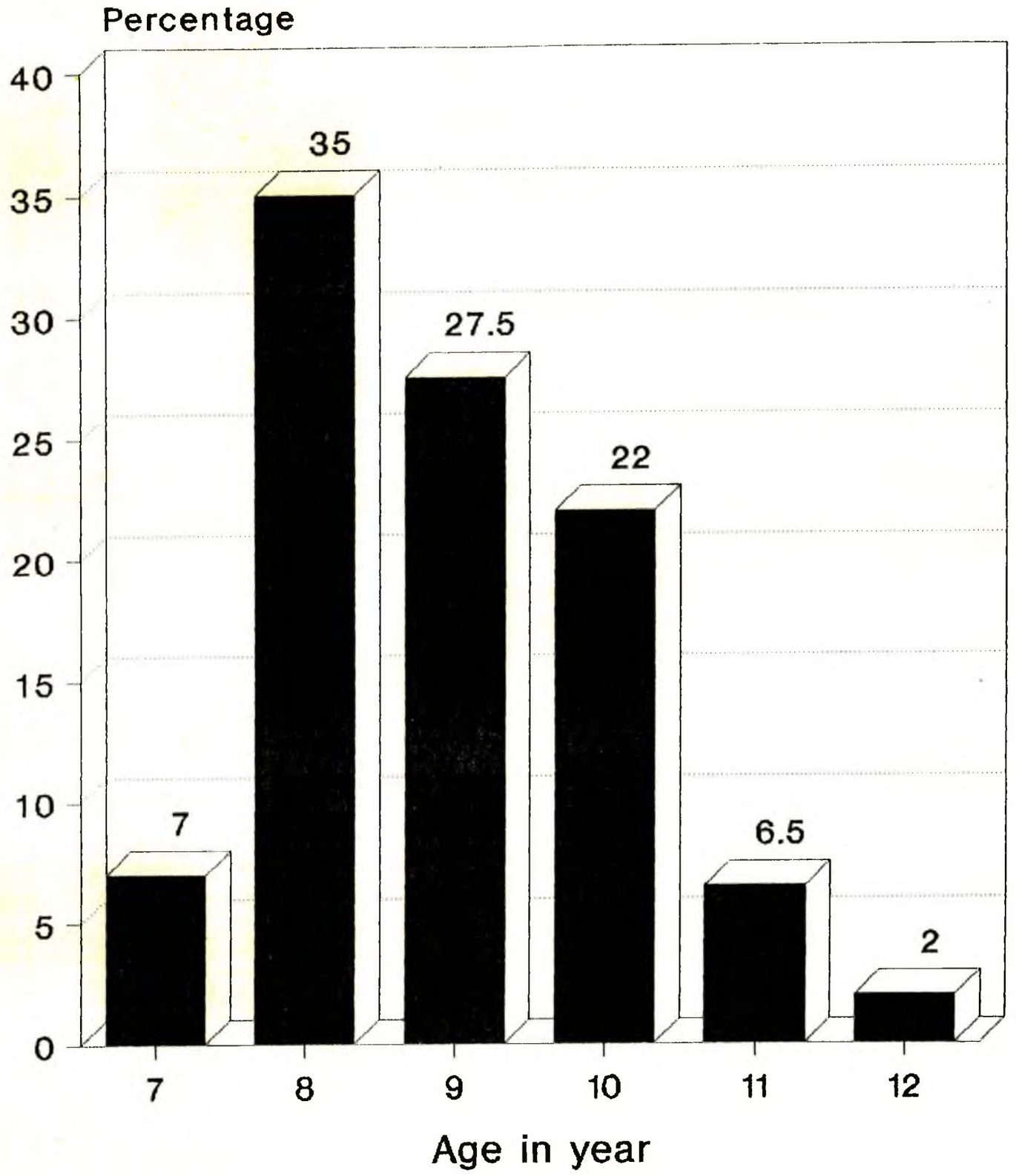
Table 14 shows the degree of association between dental caries and tooth brushing by times per day. The value of corrected chi-square with 1 degree of freedom is 12.96 which is significant different at the 0.05 level ($P<0.05$) i.e. there was a association between dental caries and tooth brush by times per day.

Table 15 presents the average nutrients intake by caries free and caries tooth children. The table reveals that energy intake was 1988.2 kcal for caries free children, 2120.1 for carious tooth children. Mean test was found to be significant different (P0.05). Protein intake was recorded to be 47.5 gm for caries free children, 32.1 for carious tooth children. Mean test was found to be significantly different ($P<0.05$). Fat intake was recorded to be 22.15 gm for caries free 18.21 gm for carious tooth children Mean test was found to insignificant ($P<0.05$). Intake of CHO was recorded to be 399.7(gm) for caries free, 456.93 gm for carious tooth children and mean test differently different $P<0.05$).

Table 16 shows degree of relationship between dental caries and consumption of carbohydrate, fat and protein rich food by times. It appears from the table that the degree of relationship

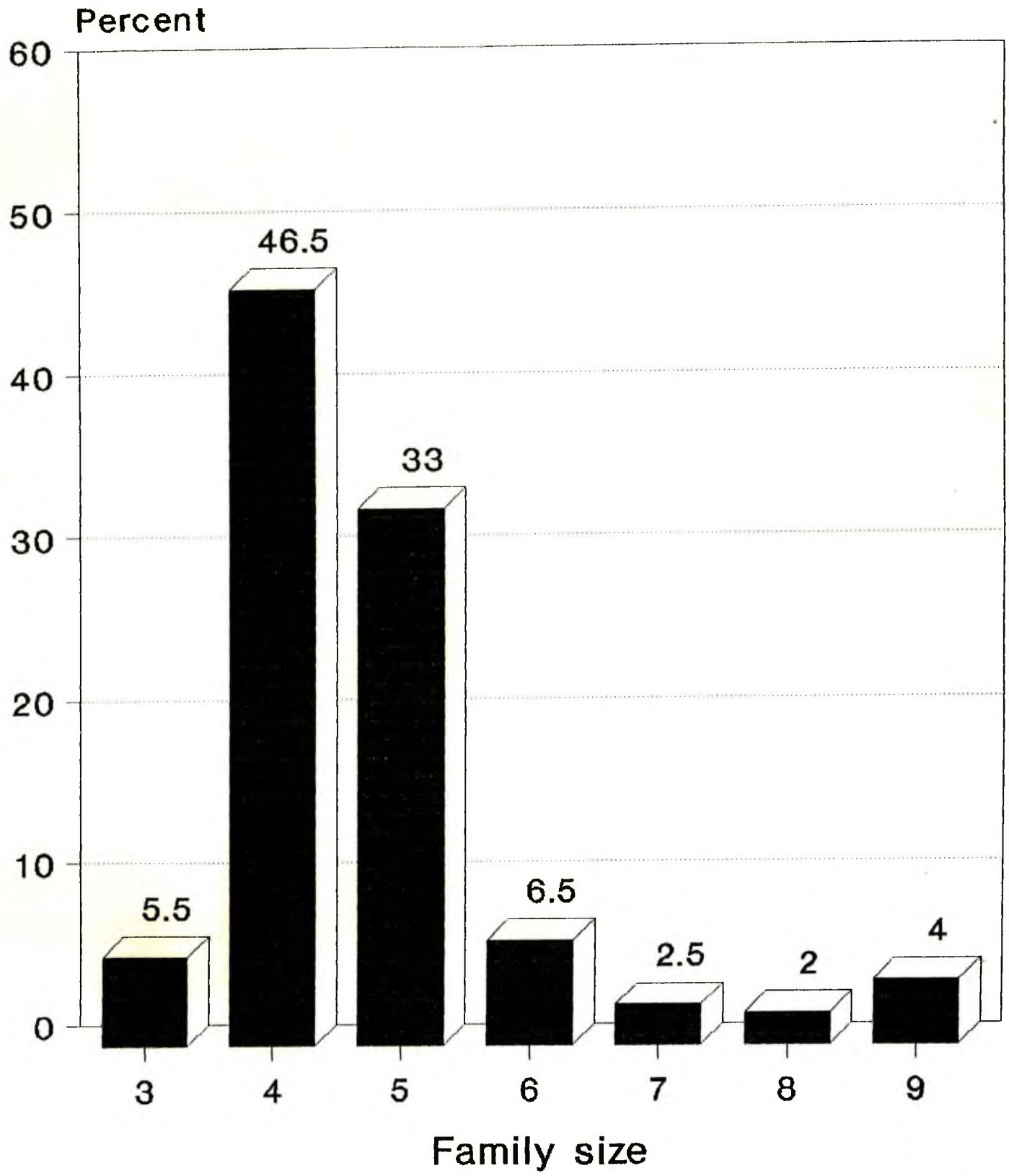
between consumption of carbohydrate rich food and dental caries was r_{CD} = 0.78.This correlation coefficient is highly significant at 0.001 level. Relationship between consumption of protein rich food and dental caries denoted by r_{PD}. The predicted value of r_{PD} = - 0.58. This value is highly significant at the 0.01 level ($p < 0.01$). The degree of relationship between consumption of fat and dental caries was r_{FD} = 0.08. This estimated value is not significantly different at the 0.05 level ($p > 0.05$).

Fig1:Age distribution of the subjects



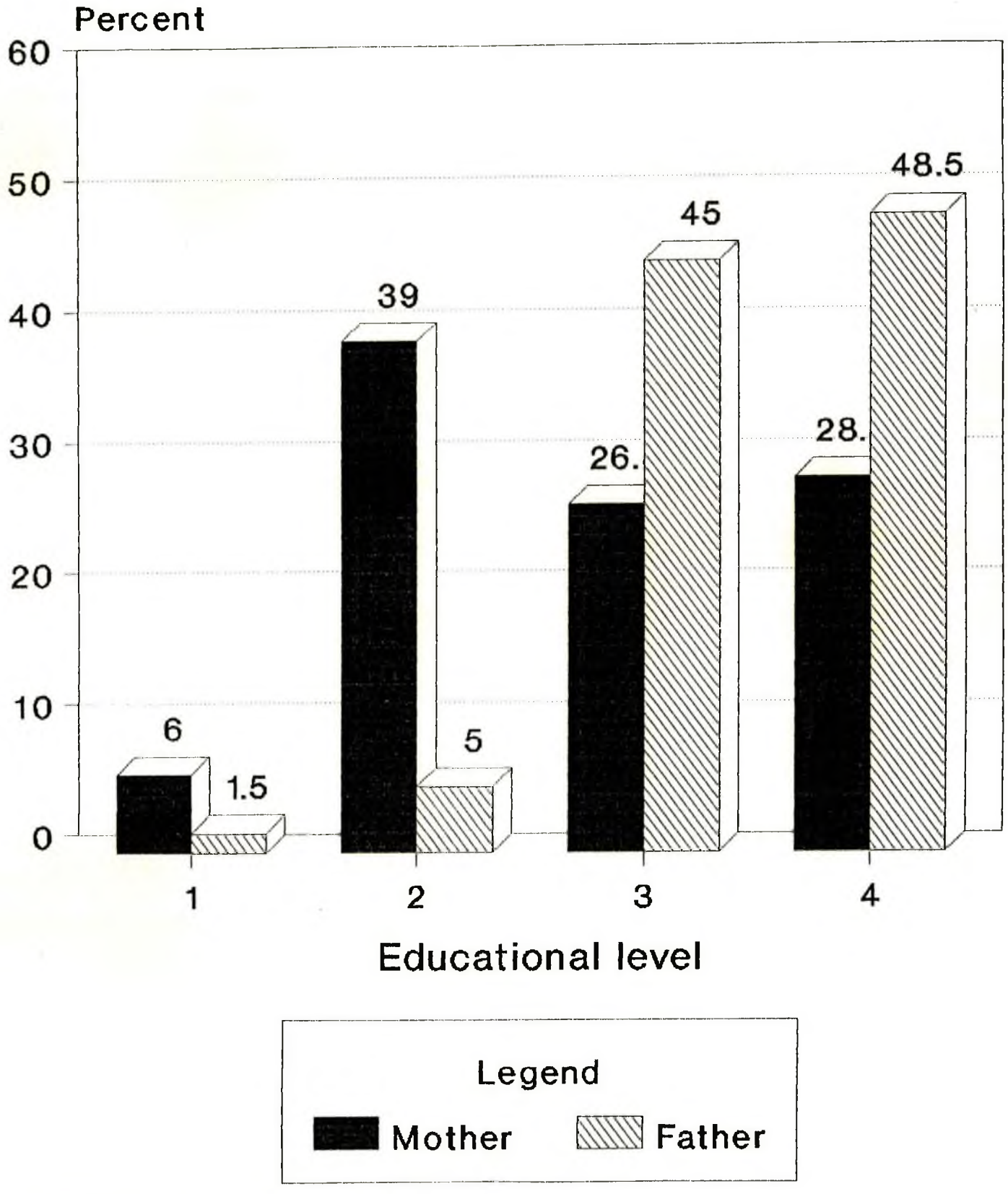
Mean = 8.92 Std Dev = 1.136
Mode = 8 Median = 9 Range = 7-12

Fig2:Family size of the study subjects



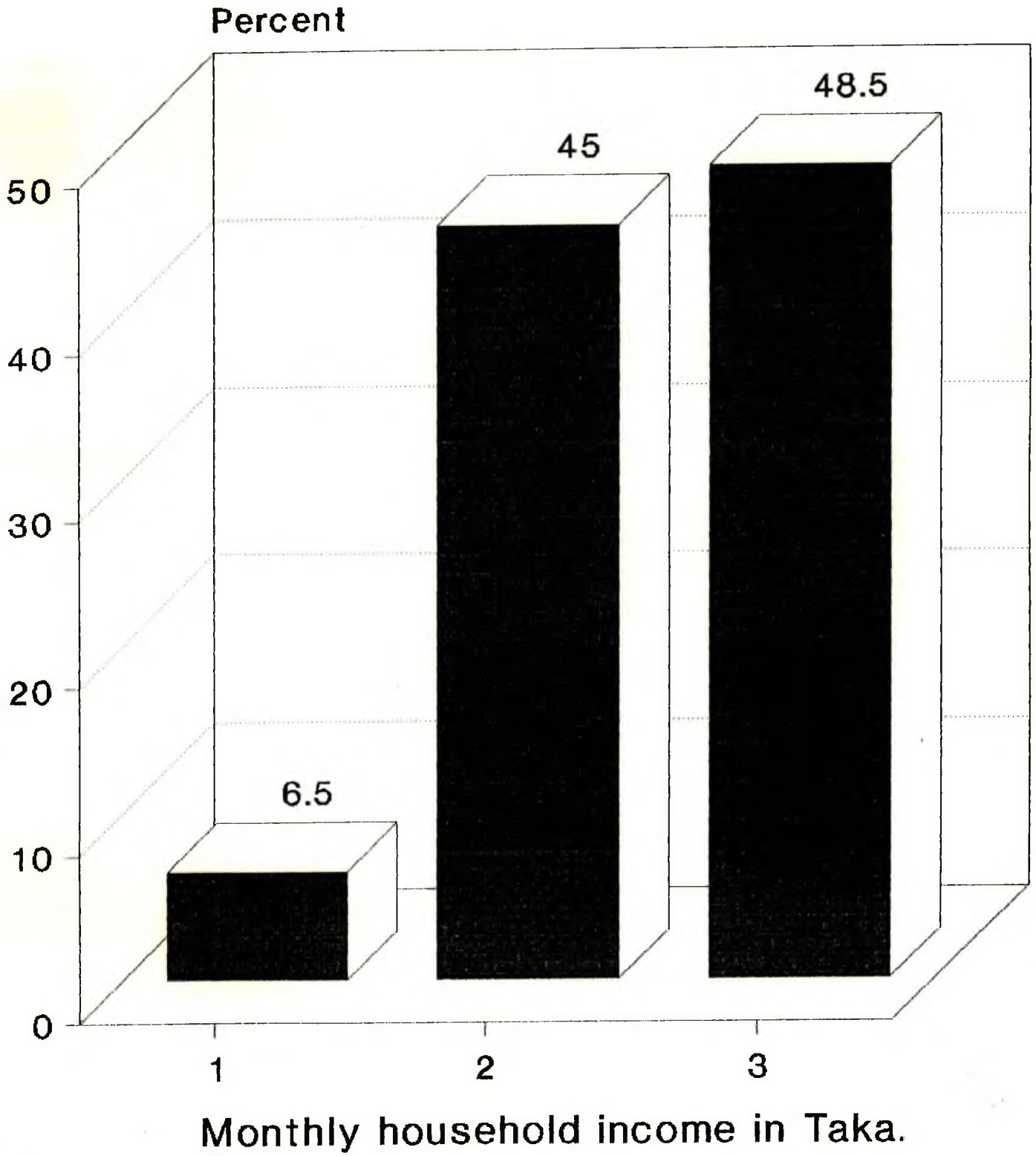
Mean = 4.76 Std Dev = 1.273
Mode = 4 Median = 4 Range = 3-9

Fig3:Educational level of parents



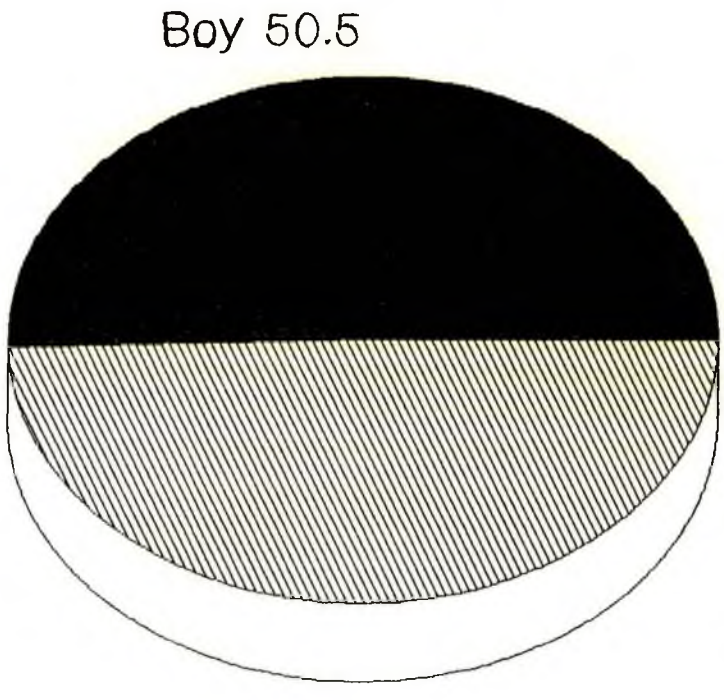
1 = Primary 2 = Secondary
3 = Graduate 4 = Post Graduate

Fig4:Monthly household income distribution of the study subjects



1 = Tk. 2000- < 5000 2 = 5000 - < 10000
3 = TK.10,000 and above

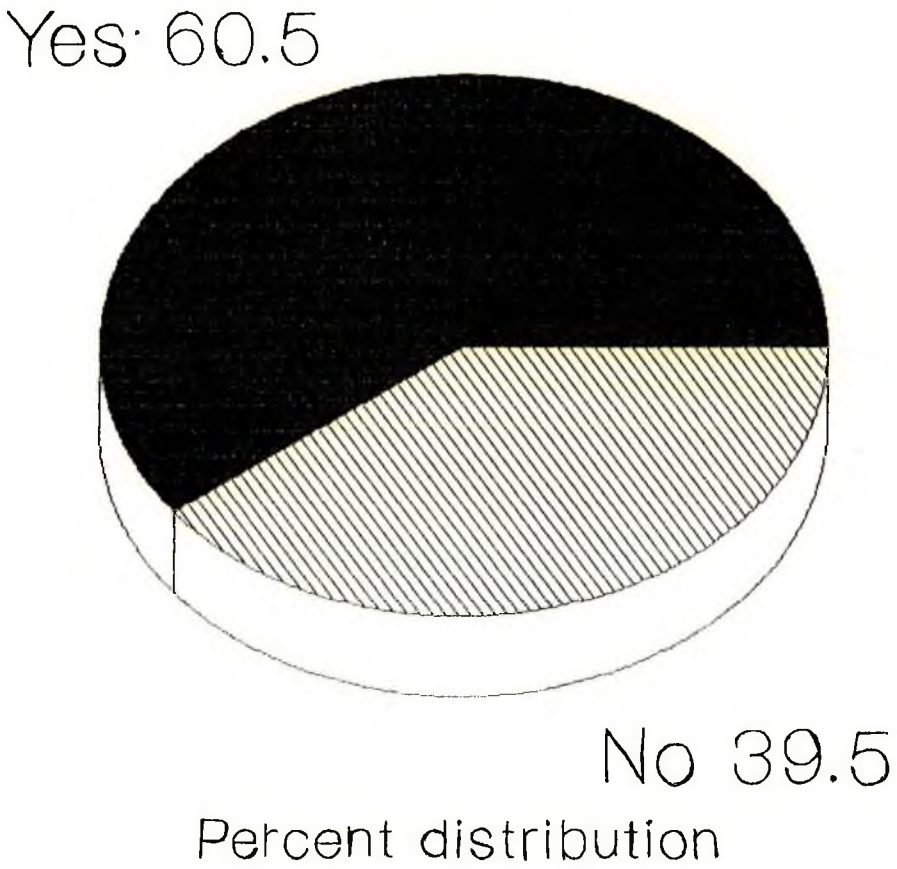
Fig5:Sex distribution of the children



Percent distribution

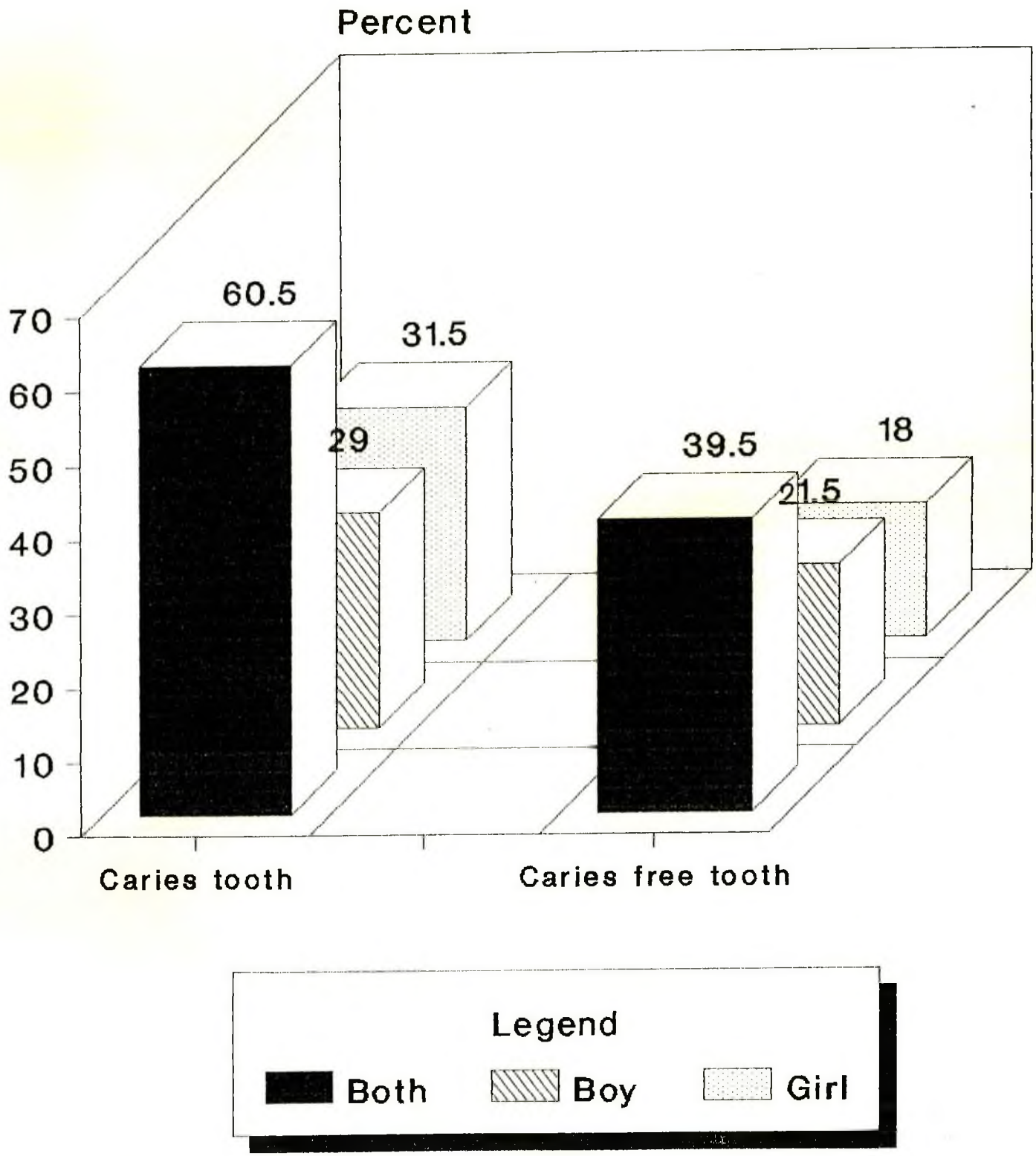
Boy = 101 (50.5 %) Girl = 99 (49.5 %)

Fig6:Carious teeth of the children



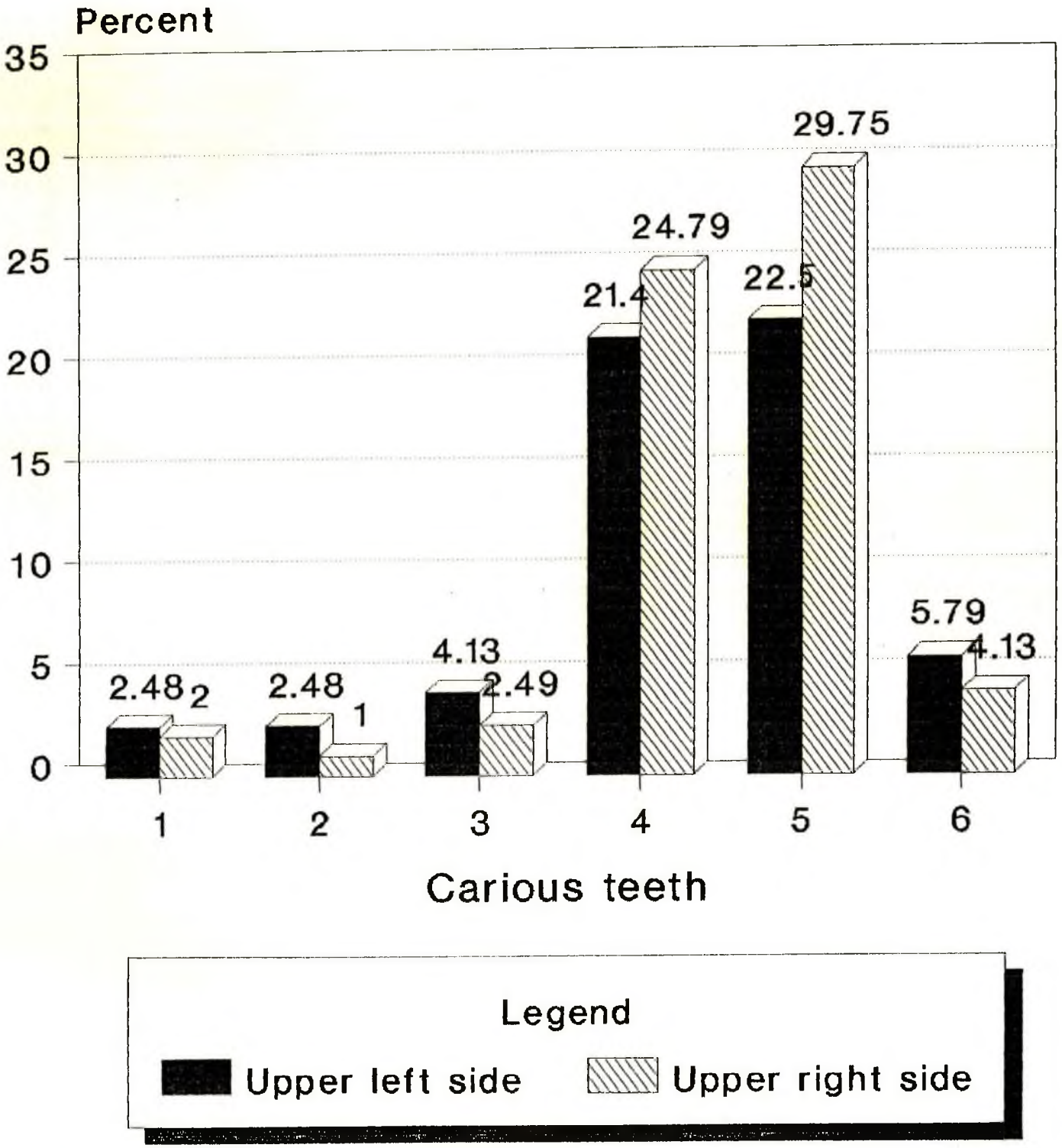
Carious teeth children=121 (60.5 %)
Caries free teeth of children=79(39.5 %)

Fig7:Carious teeth and caries free teeth by sex



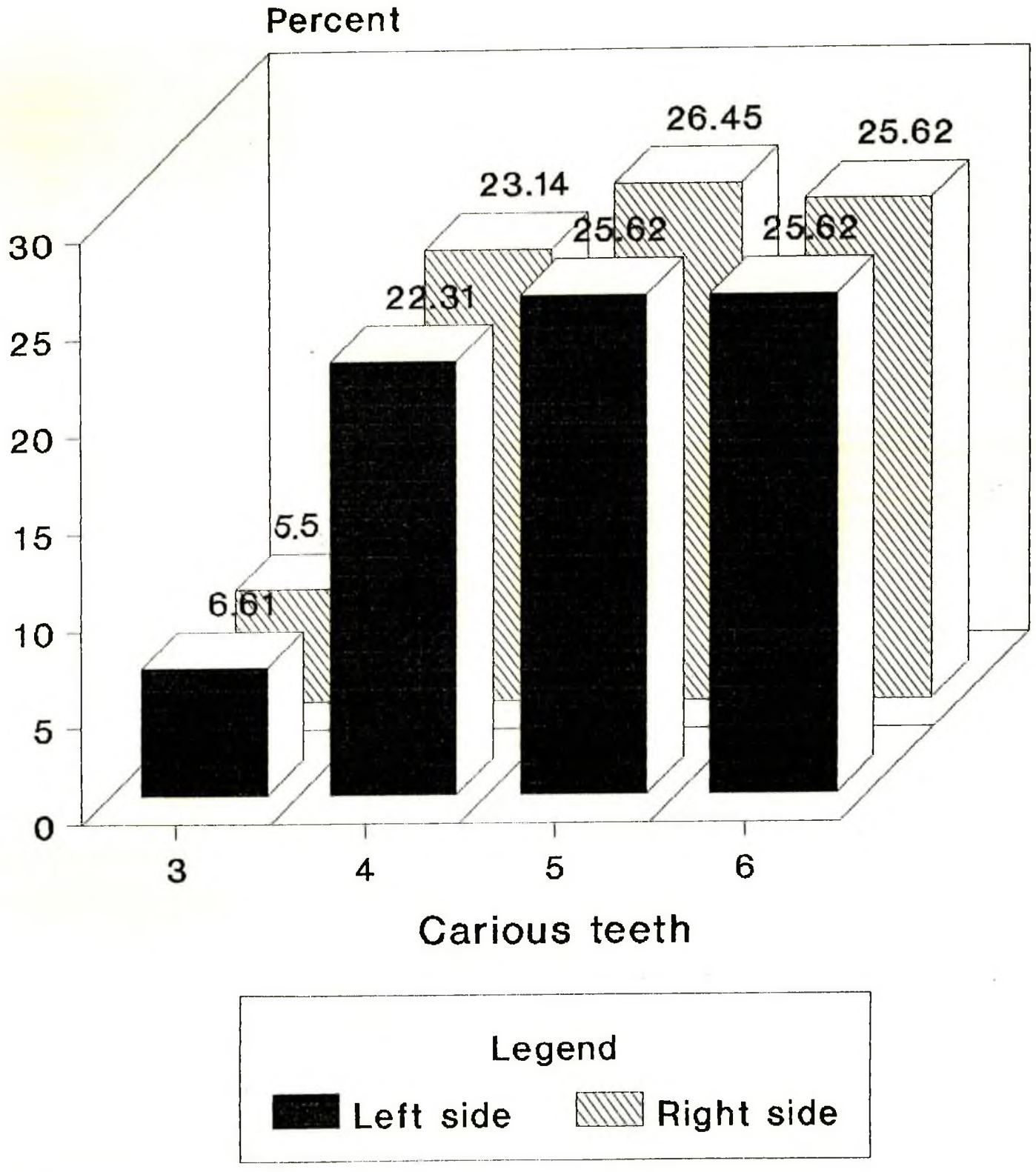
Carious teeth:Boy=58(29%) Girl=63(31.5%)
Caries free : Boy=43(21.5%) Girl=36(18%)

Flg8:carious teeth by upper left and right side



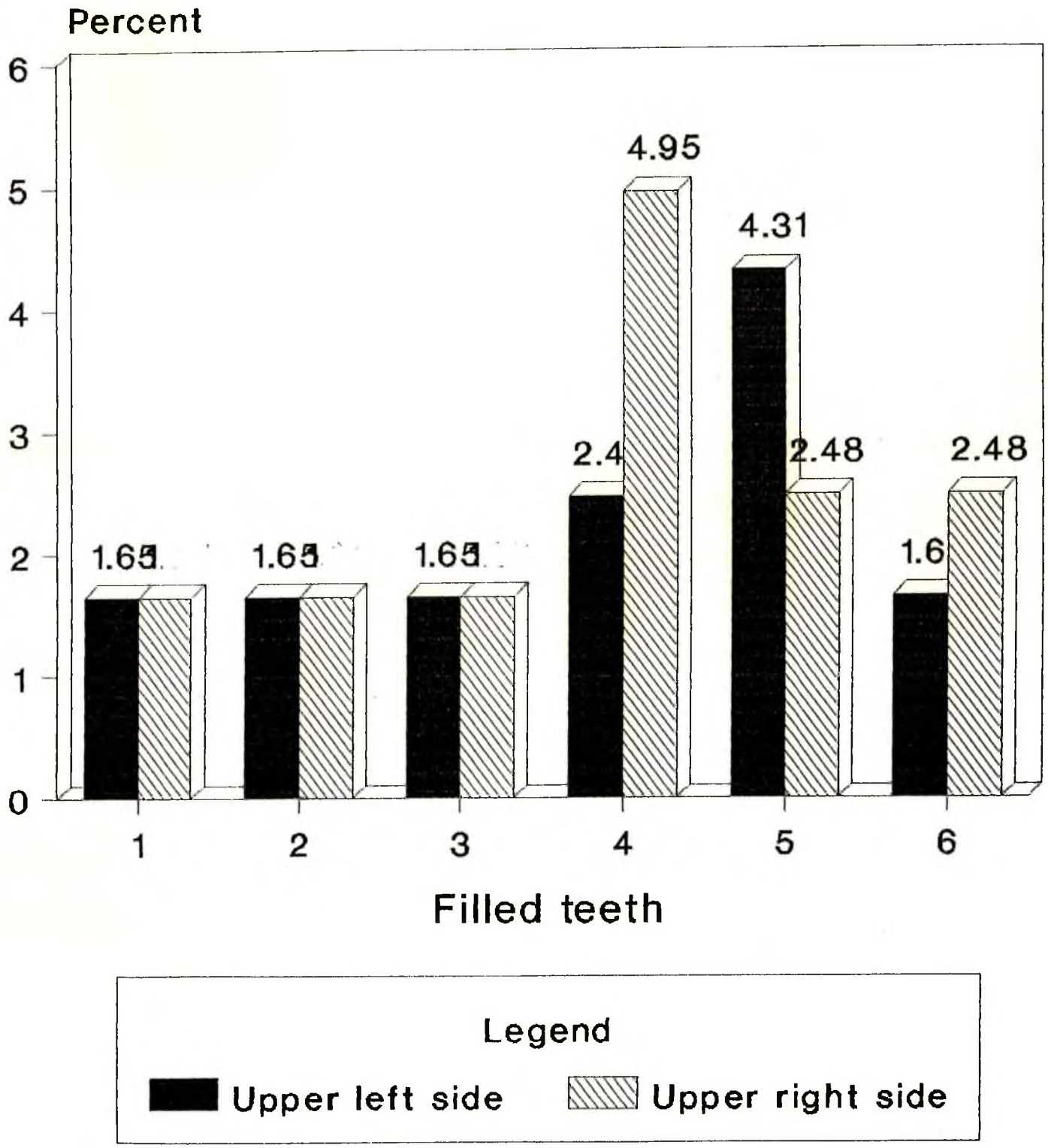
1 = Central Incisor 2 = Lateral Incisor
3=Canine 4=1st Premolar 5=2nd Premolar
6 = 1st Molar

Fig9:Carious teeth by lower left and right side



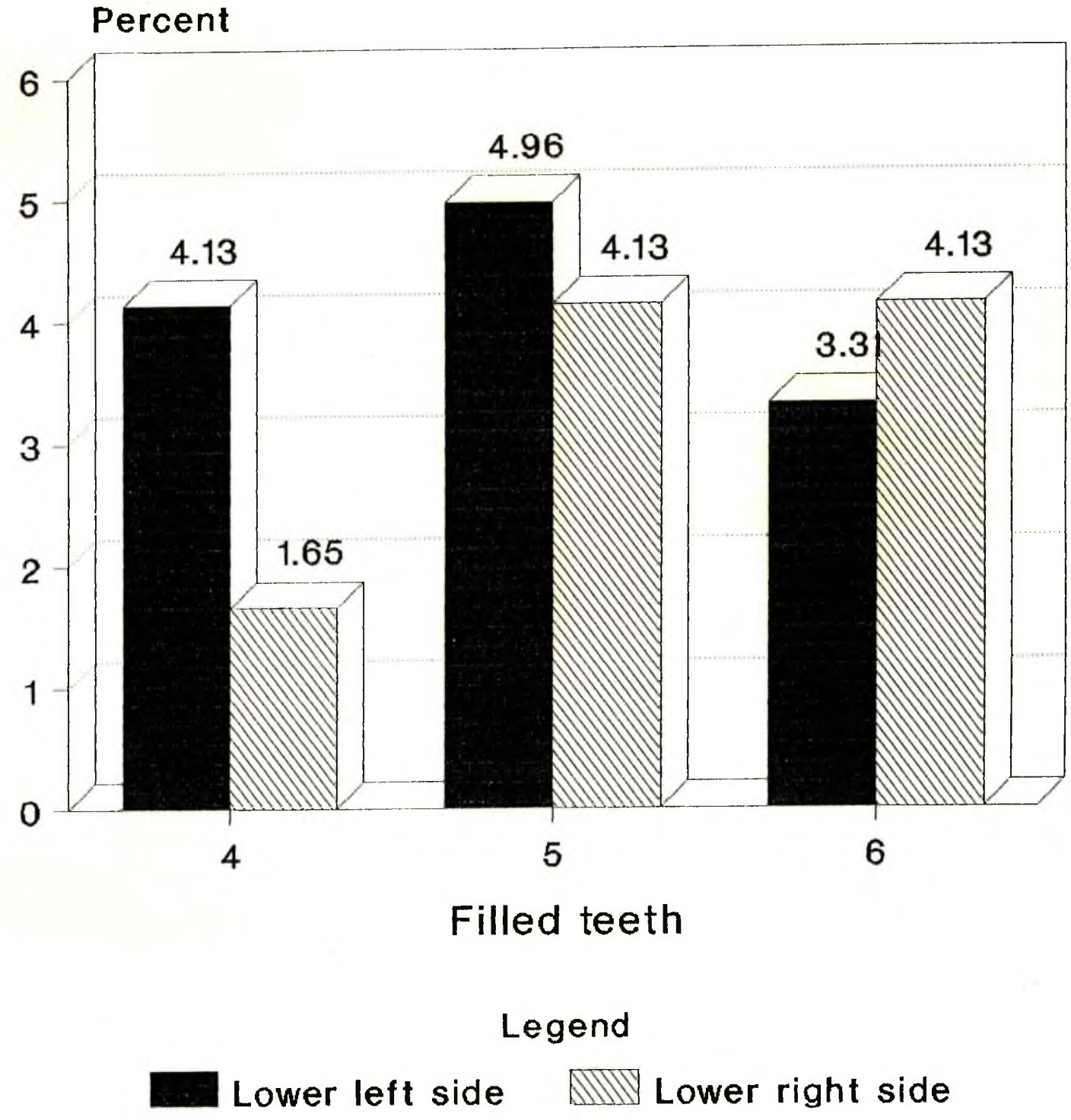
3 = Canine 4 = 1st Premolar
5 = 2nd Premolar 6 = 1st Molar

Fig10:Filled teeth by upper left and right side



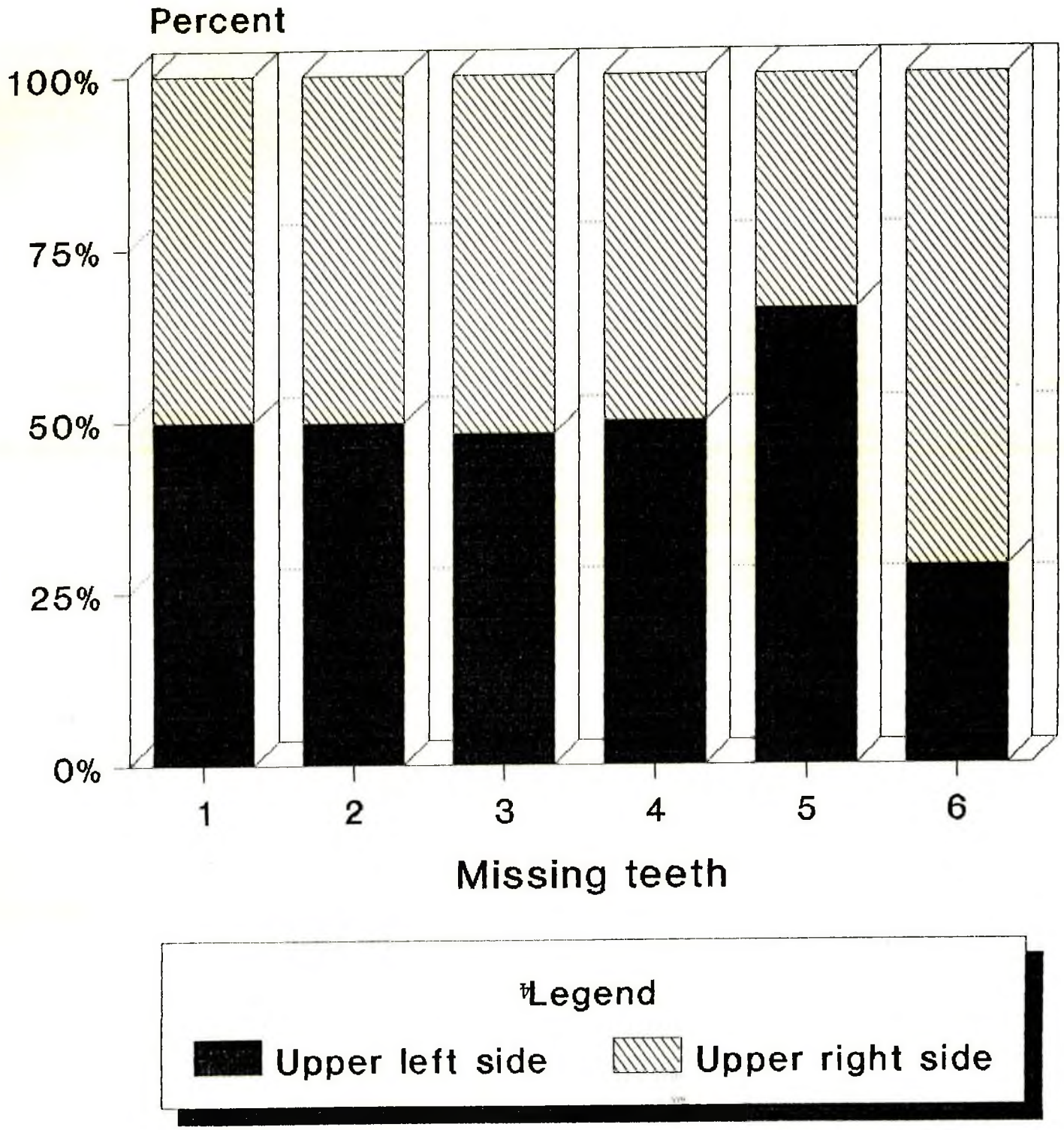
1 = Central Incisor 2 = Lateral Incisor
3 = Canine 4 = 1st premolar
5 = 2nd premolar 6 = 1st Molar

Fig11:Filled teeth by lower left and right side



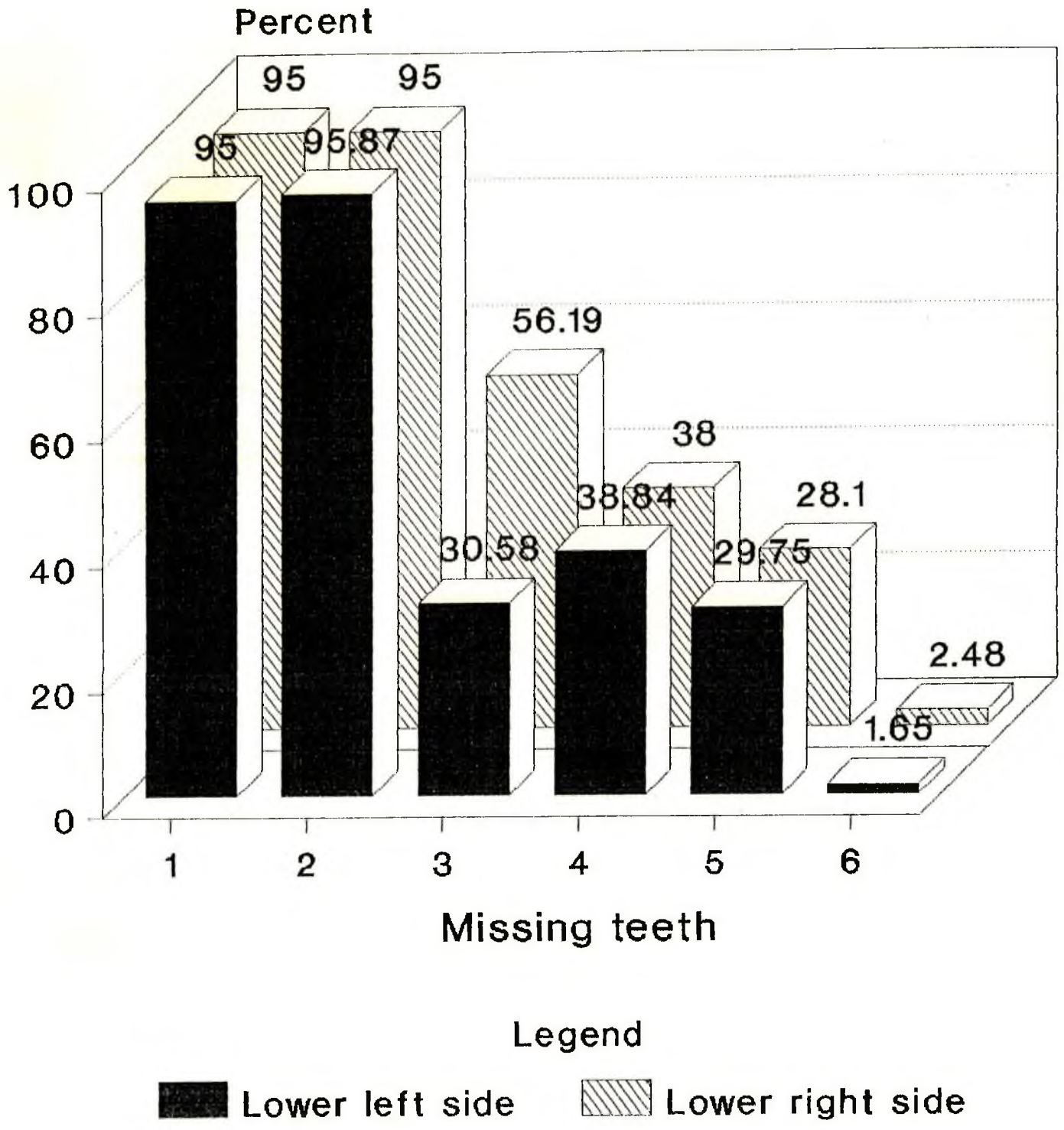
4 = 1st premolar
5 = 2nd premolar
6 = 1st Molar

Fig12:Missing teeth by upper left and right side



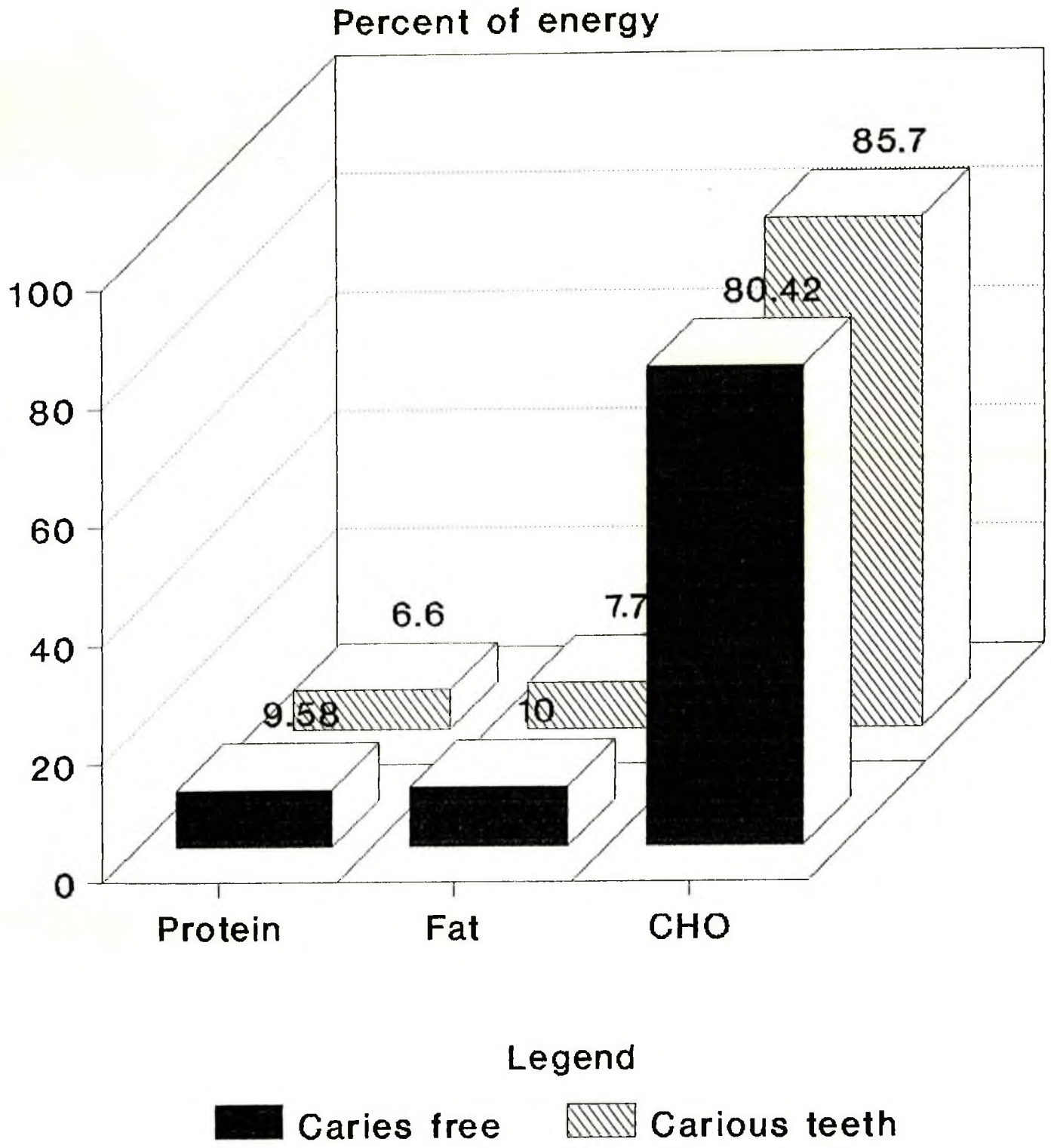
1 = Central Incisor 2 = Lateral Incisor
3 = Canine 4 = 1st permolar
5 = 2nd premolar 6 = 1st molar

Fig13:Missing teeth by lower left and right side



1=Central Incisor 2=Lateral Incisor
3=Canine 4=1st premolar 5=2nd premolar
6 = 1st Molar

Fig14:Percent of energy by protein, fat, and CHO by caries & caries free children



Caries free:Pro=9.58% Fat=10% CHO=80.42%
Carious tooth:Pro=6.6% Fat=7.7%CHO=85.7%

Table 1 : Distribution of the study subjects by dental caries (N = 200)

Status of dental caries	Number	Percent	95% confidence limit
Caries free	79	39.5	28.72 to 50.28
Carious tooth	121	60.5	51.79 to 69.2

95% confidence limit implies that there is only a 5% chance that the mentioned range excludes the percentage of the population.

Table 2 : Distribution of dental caries by sex

Dental caries	Boy		Girl		Proportion test	
	No	%	No	%		
Caries free	43	21.5	36	18.0	P > 0.05	NS
Carious tooth	58	29.0	63	31.5	P > 0.05	NS
Total	101	50.5	99	49.5	P > 0.05	NS

NS Denotes no two group are significantly different at the 0.05 level.

Table 3: Educational level of mother and knowledge about dental caries

Education	Dental caries		Total
	Yes	No	
Up to S.S.C	62	36	90
	31.0 %	18.0 %	49.0 %
Graduate	39	18	57
	19.5 %	9.0 %	28.5 %
Post Graduate	20	25	45
	10.0 %	12.5 %	22.5 %
Total	121	79	200
	60.5 %	39.5 %	100 %

Null hypothesis : There is no association between educational level of mother and Dental caries

Calculated Chi-square : 6.16

Degrees of freedom : 2

Level of significance : 0.05

Decision : Null hypothesis is rejected.

Table 4: Knowledge of parents about prevention of caries

Knowledge	Dental caries		Total
	Yes	No	
Yes	20	29	49
	10.0 %	14.5 %	24.5 %
No	101	50	136
	50.5 %	25.0 %	75.5 %
Total	121	79	200
	60.5 %	39.5 %	100 %

Null hypothesis : There is no association between dental caries and Knowledge of parents about prevention of caries.

Corrected Chi-square : 9.46

Degree of freedom : 1

Level of significance : 0.01

Decision : Null hypothesis is rejected.

Table 5 : Percent distribution of children by dental caries with associated problems.

Variable	Number	Percent
Without problem	42	34.7
Pain	66	54.6
Infection	4	3.3
Bleeding	1	0.8
Others	8	6.6
Total	121	100

Table 6 : Percent distribution of children by the nature of treatment received

Variable	Number	Percent
No treatment	83	68.6
Fluoride/ZNCL/Gell	5	4.1
ZNO/Glass-Ionomar	10	8.3
Permanent Filling	21	17.4
Others	2	1.6
Total	121	100

Table 7 : Distribution of breast feeding by carious and caries free children

Dental caries	Breast feed		Total
	Yes	No	
Caries	106	15	121
	53.0 %	7.5 %	60.5 %
Caries free	71	8	79
	35.5 %	4.0 %	39.5 %
Total	177	23	200
	88.5 %	11.5 %	100 %

Null hypothesis : There is no association between breast feeding and dental caries.

Corrected Chi-square : 0.07

Degree of freedom : 1

Level of significance : 0.05

Decision : Null hypothesis is accepted.

Table 8 : Distribution of the children by breast feed in a day by times

Breast feed in a day by times	Dental caries				Proportion test
	Caries free		Carious tooth		
	No	%	No	%	
3-6 times	30	38.0	47	38.8	P > 0.05 NS
6-12 times	9	11.4	11	9.1	P > 0.05 NS
According to needs	40	50.6	63	52.1	P > 0.05 NS
Total	79	100	121	100	

NS Denotes no two groups are significantly different at the 0.05 level.

Table 9 : Percent distribution of the children by breast feeding period

Breast feeding Period in month	Dental caries				Proportion test	
	Caries free		Caries tooth			
	No	%	No	%		
3	7	8.8	23	19.0	P > 0.05	NS
5	12	15.2	17	14.1	P > 0.05	NS
8	9	11.4	18	14.9	P > 0.05	NS
12	10	12.7	16	13.2	P > 0.05	NS
16	11	13.9	10	8.3	P > 0.05	NS
18	12	15.1	12	9.9	P > 0.05	NS
24	18	22.9	25	20.6	P > 0.05	NS

NS Denotes no two groups are significantly different at the 0.05 level.

Table 10 : Distribution of bottle feed by carious and caries free children

Dentat caries	Bottle feed		Total
	Yes	No	
Caries	96	25	121
	48.0 %	12.5 %	60.5 %
Caries free	14	65	79
	7.0 %	32.5 %	39.5 %
Total	110	90	200
	55.0 %	45.0 %	100 %

Null hypothesis : There is no association between bottle feed and dental caries.

Corrected Chi-square : 70.85

Degree of freedom : 1

Level of significance : 0.001

Decision : Null hypothesis is rejected.

Table 11 : Consumption of Chocolate, Ice cream and Chewing gum by carious and caries free children regularly

Food items	Dental caries		Total
	Yes	No	
Chocolate	40	7	47
	33.1 %	3.5 %	23.5 %
Ice-cream	45	6	51
	37.2 %	3.0 %	25.5 %
Chewing gum	29	5	34
	23.9 %	2.5 %	17.0 %
Not consumed	7	61	68
	3.5 %	30.5 %	34.0 %
Total	121	79	200
	60.5 %	39.5 %	100 %

Null hypothesis : There is no relationship between consumption of Chocolate,Ice-cream Cream,Chewing Gum and Dental caries

Calculated Chi-square : 109.8

Degree of freedom : 3

Level of significance : 0.001

Decision : Null hypothesis is rejected.

Table 12 : Distribution of carious teeth and caries free children by popular snacks and drinks

Dental caries	Popular snacks* and drinks**		
	Consumed	Not consumed	Total
Caries free	8	71	79
	4.0 %	35.5 %	39.0 %
Caries	98	23	121
	49.0 %	11.5 %	60.5 %
Total	106	94	200
	53.0 %	47.0 %	100 %

* Popular Snacks includes sweet Biscuits, sweet Fruits, Crisps, cheesy Biscuit, Sandwiches, Chanachur.

** Popular drinks included Milk (Sugar mixed), Fruit squash, Fruit Juice, Beverage, others (sweet).

Null hypothesis : There is no association between consumption of popular Snacks, drinks and Dental caries.

Corrected Chi-square : 93.53

Degree of freedom : 1

Level of significance : 0.001

Decision : Null hypothesis is rejected.

Table 13: Distribution of Mouth rinse after eating Chocolate,Ice-cream,Chewing Gum by caries free and carious teeth children

Dental caries	Mouth rinse		Total
	Yes	No	
Caries free	71	8	79
	35.5 %	4.0 %	39.5 %
Caries	21	100	121
	10.5 %	50.0 %	60.5 %
Total	92	108	200
	46.0 %	54.0 %	100 %

Null hypothesis:There is no association between Mouth rinse after eaten Chocolate,Ice-cream,Chewing gum and Dental caries

Corrected Chi-square : 98.29

Degree of freedom : 1

Level of significance : 0.001

Decision : Null hypothesis is rejected.

Table 14: Prevalence of dental caries by times of tooth Brushing

No. of times per day	Dental caries		Total
	Yes	No	
1 time	86	39	125
	43.0 %	19.5 %	62.0 %
2 times	26	36	62
	13.0 %	18.0 %	31.0 %
3 times	9	4	13
	4.5 %	2.0 %	8.5 %
Total	121	79	200
	60.5 %	39.5 %	100 %

Null hypothesis : There is no relationship between Dental caries and times of tooth Brushing.

Calculated Chi-square : 12.96

Degree of freedom : 2

Level of significance : 0.01

Decision : Null hypothesis is rejected.

Table 15: Nutrient intake by caries free and carious tooth children

Variable	Energy (Kcal)	Protein (gm)	Fat (gm)	CHO (gm)
Caries free n = 79	1988.2	47.5	22.15	399.71
Caries tooth n = 121	2120.1	32.1	18.21	456.93
Mean test	P< 0.05 S	P< 0.05 S	P> 0.05 NS	P< 0.05 S

S denotes pairs of group significantly different at the 0.05 level.

NS denotes no two groups are significantly different at the 0.05 level.

Table 16 : Degree of relationship between dental caries and consumption of carbohydrate, fat and protein rich foods by times per day.

Variable	Subject	Correlation coefficient (r)	t- test
Carbohydrate and Dental caries	200	$r_{CD} = 0.78$	P< 0.001 S
Protein and Dental caries	200	$r_{PD} = - 0.59$	P< 0.001 S
Fat and Dental caries	200	$r_{FD} = 0.06$	P> 0.05 NS

S denotes the correlation coefficient may be regarded as highly significant.

NS Denotes the correlations coefficient is not significant different at the 0.095 level.

Positive value of r implies that one variable increase as the other increases.

Negative values of r implies the one decreases as the other increase.

DISCUSSION

Prevalence of dental caries :

A total of 200 urban primary school children were studied to find out the prevalence of dental caries and its relationship between food behaviour , oral hygiene and dental caries. The prevalence of dental caries among boys and girls were found to be 29 percent and 31.5 percent respectively. In both sexes the rate was 60.5 percent with 95 percent confidence limit 51.79 to 69.2 and which was insignificant between dental caries and sex ($P > 0.05$).

Average age of the study subjects was found to be 8.92 $\pm$1.136 years with range 7-12 years.

In Bangladesh Ali S.M.K.[18] found the prevalence rate of dental caries to be 37.8 percent in 7-12 years children of an urban school in Dhaka city. The present rate of prevalence was found to be 1.6 times higher than the rate 37.8 percent found by Ali. This higher proportion may due to changes of food habit and increased availability of diagnostic facilities. Besides frequent use of fermented carbohydrate component like chocolate,ice-cream, chewing gum sweet biscuits, cheesy biscuit crisps, sandwiches, fruit squash, fruit juice and milk.

In another study over a period of 10 years in Britain showed reduction of about 30 percent in caries of the permanent dentition. The mean DMFT fallen from 8.4 to 5.6 [23].

In Britain approximately 25 percent of the school children were identified as high risk caries individual on the basis of a 2

year DMFT increment of 5 and above or a 3 years increment of 8 and above[28].

Another study conducted among rural Greek children demonstrated a higher caries incidence of decay and filled tooth surface in both primary and permanent teeth and only 15 percent were caries free in the primary teeth [44] .

The estimates of the population in England under scored the mean DMFT in 5 - 6 years old ranges from 3.60 in Salferd to 0.77 in Wycombe while the DMFT in 14-15 years old ranged from 4.82 in Grampian to 2.61 in Waycomb[29].

In Nigeria caries had increased in children of higher social class families between 1977 t0 1983[46]. In a study in Gottingen Pieper-K et al found that only 16 percent molars were missing in children [49].

Similar study showed in Zambia more than 37 percent caries with 23.7 percent poor periodontal status and 1.31 percent DMFT in one school, while in the other school had corresponding figure of 25.6 percent, 23.1 and 0.39 respectively[25].

Sonal Patel in Papua New Guinea investigated the prevalence of dental caries and found that the mean DMFT was 6.3 in 1989 while the mean DMFT was 33 in 1978[24].

In 1987 a study in Iceland demonstrated that 45.8 percent of the children were caries free and the prevalence of caries was a mean DMFT 2.4 and mean DMFS 3.3[48] .

In Italy caries incidence of a study among school children (6-10 years old) in 1970 showed 85 percent caries prevalence and

DMFT 4.77. The corresponding figures became 72 percent and DMFT 3.6 in 1980-85[33].

The second premolar teeth showed highest frequency of caries in children in this study (Fig 8,9). It was also found that majority had filled their teeth (Fig 10,11). On the other hand 98 percent of missing tooth children had been missing their decidious central Incisor and lateral incisor respectively. It may be due to fall of milk tooth or consequence of caries.

Contribution of food behaviour :

Chocolate is a fermentated carbohydrate component which plays a vital role of dental caries. Ice-cream is a cariogenic food. In the present study it was found that 33.1 percent and 37.2 percent of carious tooth children consumed chocolate and ice-cream,whereas only 3.5 percent and 3.0 percent of caries free children consumed chocolate and ice-cream.

Sugar free gums are non-cariogenic and potentially beneficial in reversing early caries, while the potential cariogenicity of sucrose sweetened gums can be modified by additives or selected patterns of use. Chewing gum has several properties which are potentially either beneficial or detrimental to the health of the oral tissues. Most chewing gum sold throughout the world is sweetened with sucrose adds to the cariogenic load of dietary carbohydrate. The present study showed that 2.5 percent of caries free and 23.9 percent of carious tooth children consumed chewing gum. Significant association between

dental caries and consumption of chocolate, ice-cream and chewing gum was found ($P < 0.001$) as shown in table 11.

It was found that only 4 percent of caries free and 49 percent of carious tooth children consumed cariogenic snack and drinks such as sweet biscuits, cakes, cheesy biscuits, crisps, fruit, sandwiches, milk, milk shake, fruit squash, fruit syrup and fruit juice (Table 12). Significant association between dental caries and popular snacks and drink was found ($P < 0.001$).

Birkhed. D et al[47] found that intake of candy and soft drinks traditionally related to dental caries. R.D. Holt[29] found that dental caries increased significantly with increasing number of intake of sweet biscuits and diluted fruit squash and milk. COMA report[23] revealed that fresh fruits, vegetables and stable starchy foods has low cariogenicity.

In Sweden caries prevalence can not be attributed to a corresponding decrease in the per capita consumption of sugar and sugar containing products. The intake of some products traditionally related to dental caries such as candy and soft drinks increased during 1960 - 1985 [45].

WHO recommended that sugar is the main causal factor in dental caries. At level of sugar consumption below 10kg/person/year incidence of caries is low. Beyond 15 kg the incidence increases more rapidly[38]

Study in Britain which analyzed on 2139 children results nearly all children had one or more snacks or drinks on most day and the popular time was mid afternoon. Caries expressed in mean

DMFT increased rapidly with increasing number of intakes[39].

Among Latin American children,caries prevalence DMFS for taking syrup medicine regularly was 3.0 compared with 2.1 for remaining children ($p < 0.05$) [48].

An interesting study relating to food behaviour of children who take beverage containing sugar before going to bed showed significantly higher caries experience than that of who did not. The irregularity of the between meal eating time caused a high tendency towards caries occurrence[64].

Data analysis from Britain on dietary habit from 3194 children aged 9-29 years reveled significant positive association between frequency of between meal consumption of soft drinks of high D.M.F.T. scores[53].

Caries prevalence in Sweden cannot be attributed to a corresponding decrease in the per capita consumption of sugar and sugar containing products . The intake of same products traditionally related to dental caries such as candy and soft drinks increased during 1960 - 1985[55].

When illustrating on the oral health behaviour, on the daily basis the Danish children had healthy foods like vegetable fruits 87 % and milk 89 % and Orange was consumed and 53 % of the children consumed sweet on a specific day[58].Again in Spain out of 304 children daily consumption of chocolate and sweet was found to be 83 percent[67].

The study in Tanzania, food behaviour had positive influence on dental caries. Children eating cakes, biscuits or sweets at

least three times a day seemed to have more caries than the rest[60].

When oral hygiene is poor even a relatively low total sugar consumption can promote decay in caries susceptible primary and young permanent teeth. The association between the amount of plaque and dental caries was statistically significant at all levels of sugar consumption.

It was revealed from a study in Bretain that the severity of the processing undergone by the snacks food and the nature of the flavoring agent with which they are coated influence dental caries[37].

Influence of oral hygiene (oral hygiene)

From the present study it was found that only 10.5 percent and 35.5 percent of caries free children rinsed their mouth after taking chocolate, ice-cream and chewing gum. Significant relationship was found between dental caries and mouth rinsing after eating chocolate, ice-cream and chewing gum ($P<0.001$). Average energy intake of carious and caries free children were 2120 Kcal and 1988 kcal. Significant difference between two groups was found ($P<0.05$). Mean intake of protein and CHO of carious and caries free children were found to be 32.1 gm and 456.93 gm v.s. 47.5 gm and 399.71 gm respectively. Significant difference between two groups was found ($P < 0.05$). High intake of Carbohydrate favours development of caries. Intake of Fat of carious and caries free children were 18.21 gm and

22.15 gm, a non significant difference between two groups was found ($P<0.05$).

In Egland 295 children were reported to have daily tooth brushing, 48 % of those children were caries free compared with 89 % among those who did not clean daily [56]. Another study in Camden demonstrated increment in caries experience to be 4.3 DMF teeth in those who brushed less frequently. The difference was significant ($p < 0.05$)[56].

Tooth brushing at least twice a day was performed by 88 percent of 212 Danish children and most used fluoridated paste[58].

Children who took fluoride tablets regularly had less caries (mean DMFT 1.1) than those who used fluoride tablets irregularly or not at all mean DMFT 2.8 percent ($p<0.001$) as revealed in a Latin American study. The frequency of tooth brushing was studied by Van-Nieuwenhuysen et al showed that the frequency of tooth brushing was 23 % of children brush their teeth once a week or less, 46 percent brush once a day and 31 percent brush their teeth twice a day or more. 15 percent of the children never consult with the dentist,44 percent consult in case of toothaehe, and 41 percent go to the dentist office for control. Only 3.2 percent of the children use regularly and appropriatety fluoride tablets[59].

Morehead et al studied that children who complied with brushing 70 percent of the session had significantly lower caries increment[62]. In a tudy in Gravina, oral hygiene had been expressed with values ranging from 1 to 3, the point 1 showed the best situation and 3 the worst[65].

Another study showed that children who visited dentist regularly for dental prophylaris showed low caries experience and low periodontal disease and also have reduction in DMFT score[66].

In spain 73 percent reported that they washed their teeth occasionally or never, 53 percent had never visited the dentist and 5 percent had not received preventive care for dental disease[67]. Again in a Baltimore study, poor oral cleanliness was accompanied by an increase in the total caries experience[69].

Furthermore, it was evident from a Scottish study that free smooth surface lesions were likely to develop initially and more likely to progress in individuals with poor oral hygiene[27].

Interrelationship of various factors

The study revealed that more than 54 percent of the caries tooth children had been suffering from pain. It may be due to their indiscriminate eating particularly sugary food items and not practicing proper tooth brushing, as well as non-habitual regular dental check-up & treatment.

The study also showed that more highly educated parents of children have less dental caries than those of poorly educated parents (table 3). Significant relationship between educational level and dental caries was found ($P < 0.01$).

Other studies in Netherlands also showed that more highly educated parents have better dental health than those of poorly educated parents[71].

It is remarkable that only 1.5 percent and 6.0 percent of father and mother had primary education. The rest had S.S.C, H.S.C, Graduation and post graduation degree. Only 24.5 percent had knowledge about prevention of dental caries. Significant association between knowledge of parents about caries prevention and dental caries was found ($P < 0.001$) as shown in table 4. This implies that as educational level of parents increases, the number of carious teeth decreases.

There is a significant positive co-relation of education of the parents with the percentage of childs energy intake provided by food .(Here r = partial = 0.18, n = 284 and p = 0.0001). Similar study performed among Dutch tanagers showed increased risk of unhealthy food habits which cause caries in children of less educated parents[43].

It was found that 35.5 percent and 53.0 percent of caries free and caries tooth children were breast fed respectively (Table 7). Insignificant association between breast feed and dental caries was found ($P>0.05$). The study showed that 38.0 percent and 38.7 percent of caries free and carious tooth children were breast fed at least 3-6 times per day. More than 11 percent and 9.4 percent of caries free and carious tooth children were breast fed between 6 and 12 times per day. Proportion test was found not significantly different ($P>0.05$). It was also found that breast feeding period of caries free and carious tooth children were not significantly different ($P>0.05$).

The present study showed that 7 percent of carious tooth children were bottle fed (table 10). Significant association

between dental caries and bottle fed was found ($p<0.001$).
In a Glasgow study it was shown that bottle fed with sugar mixed milk was the main causal factor in dental caries in a multiracial school[26]. Similarly, Walsh and Seow also found that sugar acts as substrates for cariogenic micro-organism in an Amazonion study[46]. According to Knou et al, the DFT indices according to feeding groups were 8.86 in the bottle feeding, 7.51 in the breast feeding and 6.77 in the mixed feeding group[64]. Another study by Ripa also suggested that prolonged bottle feeding of human infant with bovine or formula milk may be responsible for caries development[50].

Caries prevalence of 10-13 year old children attending fee paying schools was significantly higher than non fee paying schools in Nigeria. The consumption of sugar, sweets and cakes was much higher in the fee paying school[52].

Overall aspects of the research.

It is of interest to note that the degree of relationship between frequent intake of carbohydrate and dental caries was found to be $r_{CD} = 0.78$ which was highly significant ($P<0.001$). This implies that increase in the number of children who have taken frequent carbohydrate rich food,increases the number of dental caries. Negative correlation coefficient between frequent intake of protein rich food and dental caries was found to be $r_{PD} = -0.59$ which was highly significant ($P < 0.001$). This implies that frequent intake of protein rich food decrease the number of dental caries. Degree of relationship between frequent

intake of fat and dental caries was found to be $r_{FD} = 0.06$ which was not significant ($p > 0.05$). The frequent intake of Carbohydrate rich food is the most important cause of dental caries. Frequent intake of protein rich food is potentially beneficial in reversing dental caries. Frequent intake of Chocolate, Ice cream, Sugar mixed Chewing gum, Snacks and drinks are harmful for dental health.

SUMMARY

A prospective study on food behaviour, oral Hygiene and dental caries among urban primary school children was carried out to find out prevalence of dental caries and to ascertain its relationship with socio-economic characteristics and oral hygiene. The study was conducted by a questionnaire survey and physical examination of the children at the school.

Two hundred students were selected randomly aged 7-12 years from 2 urban affluent schools of Dhaka City. The mean family size was 4.76 $\pm$ 1.27. Educational level of fatfer was 4.5 percent graduate and 48.5 percent post graduate whereas that rate for mother were 26.5 and 28.5 percent respectively. More than 5 percent of the household income ranged between 2001 and 10,000+ taka per month. More than 48 percent had income of taka on 10,000 and above per month. More than 50 percent of the children were male and 49.5 percent were females. About 40 percent of the children were caries free and 60.5 percent had caries.

It was observed that intake of carbohydrate by children with carious tooth was 85.7 percent, intake of protein was 10 percent and fat was 7.7 percent.

The degree of association between dental caries and bottle feeding was highly significant at the 0.001 level .

The degree of relationship between dental caries and consumption of chocolate, ice cream and chewing gum was highly significant at the 0.001 level; which implies that there was a strong relation between dental caries and consumption of

chocolate, ice cream and chewing gum.

The association between dental caries and mouth rise after eating chocolate,ice cream and chewingum was highly significant at the 0.001 level. The association between dental caries and tooth brushing by times per day was significant different at the 0.05 level.

The correlation coefficient, between consumption of carbohydrate rich food and dental caries was $r_{CD} = 0.78$, which is highly significant at 0.001 level.

Relationship between consumption of protein rich food and dental caries was $r_{PD} = - 0.68$. The value is highly significant at the 0.01 level. The degree of relationship between consumption of fat and dental caries was $r_{FD} = 0.08$, which was not significantly different at the 0.05 level.

More sugary foods in the form of ice cream and chocholate besides high carbohydrate diet consumption, along with improper mouth rinse and on brushing have contributed towards higher prevalence of Dental Caries. Proper health education and by demonstrating correct way of brushing teeth may be useful in reduction of caries in children.

Conclusion

The study shows that knowledge about caries formation and educational status of the mothers are important determinants for dental caries in urban school children. Bottle feeding is increasingly found to be harmful for dental health, because sugary food is strongly associated with dental caries.

Frequent intake of chocolate, ice-cream, chewing gum, sweet biscuit, sandwiches, sugar mixed milk, fruit squash, fruit juice, fruit syrup have played roles in dental caries. Frequent intake of carbohydrate containing food is the major cause of bad dental health and as well dental caries. Frequent intake of protein containing food is potentially beneficial to dental caries. But frequent intake of fat containing foods, fresh fruits, vegetables and stable starchy foods are not harmful for dental health. Regular brushing and proper mouth rinsing after eating popular snacks and drinks playes a vital role to prevent dental caries.

Dental health education of mother and practical demonstration of proper brushing to children may be very useful in prevention of caries for urban school children.

Recommendations

1) Proper and regular tooth brushing particularly after breakfast and at bed time should be practiced.

2) By using pictorial demonstration about dental care should be taught to the children by the school teachers at regular intervals.

3) Rinsing mouth after every meal should be advised particularly after sugary food.

4) Dental check-up at least once in six months should be introduced at the school level.

5) Advantage & disadvantage of oral cleanliness and maintenance of oral hygiene should be included in more descriptive forms in the text books of primary school children.

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STUDY ON FOOD BEHAVIOUR, ORAL HYGIENE AND DENTAL CARIES AMONG URBAN PRIMARY SCHOOL CHILDREN

A : SOCIO-ECONOMIC AND DENTAL CARIES SURVEY FORM.

1. :NAME :_____ 1. MALE 2. FEMALE

2. AGE : _____ 3. NAME OF GUARDIAN :_____

3. ADDRESS :_____

4. FAMILY MEMBER :

MALE	FEMALE	BOY	GIRL	TOTAL

5. PARENT'S EDUCATIONAL QUALIFICATION :

EDUCATION	PRIMARY	SECONDARY	GRADUATE	P. GRADUATE
FATHER	1	2	3	4
MOTHER	1	2	3	4

6. MONTHLY INCOME

2000-<5000	5000-<10000	10000 & ABOVE
1	2	3

7. DO YOUR BABY BRUSHES TEETH EVERYDAY ?

YES	NO
1	2

8. HOW MANY TIME IN A DAY ?

ONE TIME	TWICE	THRICE	AT BED TIME
1	2	3	4

9. HOW YOUR BABY BRUSHES TEETH?

PASTE & BRUSHES	MASWAKE	OTHERS
1	2	3

10. HAVE ANY CARIES IN TEETH ? 1. YES 2. NO

11. HAVE ANY IDEAS ON PREVENTION OF CARIES ? 1. YES 2. NO

12. IF ANY, FROM WHERE ?

1. DENTAL/MEDICAL HOSPITAL 2. ANY PERSON OF DENTAL/MEDICAL 3. PRIMARY HEALTH CARE CENTRE 4. OTHERS

13. CARIOUS TEETH :

	LLS							URS						
	7	6	5	4	3	2	1	1	2	3	4	5	6	7
	7	6	5	4	3	2	1	1	2	3	4	5	6	7
	LLS							LRS						

14. FILLED TEETH :

	ULS							URS						
	7	6	5	4	3	2	1	1	2	3	4	5	6	7
	7	6	5	4	3	2	1	1	2	3	4	5	6	7
	LLS							LRS						

15. MISSING TEETH:

	ULS							URS						
	7	6	5	4	3	2	1	1	2	3	4	5	6	7
	7	6	5	4	3	2	1	1	2	3	4	5	6	7
	LLS							LRS						

16. MAJOR PROBLEM : 1. PAIN SENSATION 2. SWELLING / PUS DISCHARGE 3. OTHERS PROBLEM

17. ANY TREATMENT DONE ?

1. FLURIDE/ZNCL/ JEL APPLICATION 2. ZNO/GLASS IONOMAR PERMANENT FILLING 3. TOOT H EXT RACTION OR PUS DRAIN

18. WHEN YOU KNOW FIRST THE PROBLEM?

LAST WEEK BEFORE LAST WEEK UNTIL COMPLAIN

19. DO YOU FEED YOUR BABY BREAST FEED ? 1. YES 2. NO

20. HOW MANY TIMES A DAY ?

1. 3-6 TIME 2. 6-12 TIMES 3. ACCORDING TO NEED

21. HOW MANY MONTHS ?

1. 3 MON 2. 5 MON 3. 8 MON 12/10/18/24

22. DO YOU FEED YOUR BABY BOTTLE FEED ? 1. YES 2. NO

23. HOW MANY TIMES IN A DAY ?

1. 3-6 TIMES 2. 6-12 TIMES 3. ON DEMAND

24. DO YOUR BABY EAT THE FOLLOWING ?

1. CHOCOLATE 2. ICE CREAM 3. CHEWING GUM

25. IF EAT CHOCOLATE, ICE CREAM, CHEWIN GUM WRITE DOWN SERIALLY

1. ..... 2 ..... 3. .....

26. HOW MANY TIMES IN A DAY & WHEN MENTION THE TIME ?

27. AFTER TAKING CANDY/ICE CREAM/CHEWIN GUM DO YOUR BABY :-

A. DRINK WATER A: 1. YES 2. NO B. 1. YES 2. NO

FOOD BEHAVIOUR SURVEY FORM

FOOD ITEMS	DESCRIPTION	WEIGHT IN GM	BREAK FAST	MID MORING	LUNCH	MID AFTER	DINNER	BED TIME
RICE/BREAD								
MURI/CHIRA								
SUGAR/GUR								
FISH/MEAT								
LEAFY VEG,								
VEGETABLE								
DAL								
SWEETT								
BISCUTE								
CHEESY								
BISCUIT								
TOSTE								
BISCUTE								
FRUITS								
APPLE								
ORANGE								
BANANA								
MANGO								
GUAVA								
SWEET FOOD								
SWEETS								
PAYASH								
SEMAI/JARDA								
YOUGART/JELLY								
JAM/BUTTER								
HALUA								
SNACKS								
SANDWICH								
PATIES/								
PASTREE/								
CREAMROLE/								
VEG. ROLE								
DRINKS								
MILK/TEA								
FRUIT JUICE								
SQUASH/								
SARBET								
COCACOLLA								