Original Article

DENTAL ATTENDANCE IN PEDIATRIC DENTAL CLINIC AFTER DENTAL TREATMENT UNDER GENERAL ANESTHESIA OR NITROUS OXIDE IN THE DEPARTMENT OF PEDIATRIC DENTAL CLINIC IN THE UNIVERSITY OF GREIFSWALD, GERMANY

Mohannd Abdul wahab B Alsaedi[1],Christian Splieth[2],Mohammad Alkilzy[3], Faris T. Alsaedi[4], Atheer T Alsaedi[5]
1. M.Sc. of Science in Pediatric Dentistry, University of Greifswald, Germany
2. Professor and Head,Dept. of preventive and Pediatric Dentistry, University of Greifswald, Germany.
3. Assist.Prof. Dept. of preventive and Pediatric Dentistry, University of Greifswald, Germany.
4. MBBS.
5. MBBS

ABSTRACT:

Even though oral health is a very important part of general health, few studies have focused on the factors that affect dental attendance patterns. This retrospective study was conducted at the Department of Preventive and Pediatric Dentistry at the University of Greifswald from July 2013 up to October 2014 to observe and analyze the factors that may be related to children's adherence to regular dental attendance. A total sample of 253 patients' records within the age of 3-18 years old who visited the department clinic during the period of study was selected. Data was analyzed using SPSS software program, where different relevant statistical tools were applied.

The most important finding of this study is that 75% of patients came back to the clinic two times or more, 13% came back only one time, while 12% did not come back at all; but when comparing the treatment category with number of attendance times for follow-up visits, 93% of patients who received treatment under behavior management (BM), 75% of who received treatment under nitrous oxide (N_2O), and 57% of who received treatment under general anesthesia (GA) came back for follow-up visits more than two times. It was also found that there is a strong statistically significant relationship between the treatment category in the initial treatment visit and the number of attendance times for follow-up visits (P Value <0.01). Therefore, patients who received treatment under BM were more willing to come back than patients who were treated under N_2O or GA. This study concludes with the recommendation of spending more attention on the treatment category in the initial treatment visit and trying to minimize the use of N_2O or GA in the initial visit.

Keywords: teachers, traumatic dental injury, knowledge, attitude, practice.

INTRODUCTION:

1. Outline

Failed patient attendance is a well-recognized and frustrating problem common to all health care facilities. Missed appointments have considerable economic impact for service providers and may seriously compromise the patient's own health and treatment (Thomas, 2004). A small number of studies have investigated failed outpatient attendance rates within a range of dental settings. The lowest nonattendance rates, at around 9%, appear to be within general dental

practices (Reekie et al., 1998). Within salaried community dental services, the frequency of missed appointments reported ranges from 13% to 19% (Poulsom, 1991; Skaret et al., 1998;Trenouth et al., 1991) investigated failure rates at a numberof different clinics within a British dental hospital. These failure rates were found to range widely, from 4% (prosthetics clinic) to 20% (oral surgery clinic). In view of these considerable failed attendance figures, investigators have tried to identify reasons behindpatients'failure to attendtheir dental appointments. It would seem that ''simple'' forgetfulness accounts for a large proportion of failed patient appointments (Trenouth et al., 1991; Herrick et al., 1994). However, other common excuses include illness, transportation difficulties, conflicting commitments, and denial of ever making the designated appointment (Richardson, 1998). Interestingly, a number of risk factors have been associated with the habit of failing to attend appointments. Can et al. (2003) reported that patients living in areas of high social deprivation were 2.7 times more likely to miss an orthodontic appointment than patients from more affluent districts. Dental anxiety and high caries incidence have also been correlated with poor attendance (Woolgrove et al., 1986; Skaret et al., 1998).

2 .Value of the study

Many researchers focused on preventive measures concerning oral hygiene more

than regular dental attendance (Badri et al., 2014).

In addition, there are fewprevious studies focusing on the role of N_2Oon the dental attendance in the following period after the treatment and its comparison to GA or on the dental chair (BM).

General objective of the study

The overall purpose of this study is to observe and analyze the factors that may relate to children's adherence to regular dental attendance.

Specific objectives of the study

1. To identify the relationship between treatment category and the medical history of patients.

2. To specify the cause of reference and type of treatment in the initial visit.

3. To determine the percentage of patients who returned to general dentist (GP) after treatment.

4. To show the percentage of patients who visitedtheclinic after treatment for follow-up.

5. To investigate the relationship between(gender, age, treatment category and travel distance)and(dmft/DMFTandattend ance after treatment).

6. To calculate the dmft/DMFT average forparticipated patients.

Research Questions

Is there any statistical difference between patients according to gender, age, treatment category or travel distance with respect to dmft/DMFT and dental attendance after treatment?

MATERIALS AND METHODS:

Aim of Study: The aim of this study is to observe the dental attendance pattern of the children aged 3-18 years who got dental treatment under N_2OGA and the children who got dental treatment but under BM.

Type of study: The results will be carried out in a retrospective study.

Period of study: July 2013 up to October 2014 to observe and analyze the factors which may related to children's adherence to regular dental attendance where the pattern of the dental attendance has to be observed within the first 12 months after participated patients started their treatment i.e. (from 08.2014 to 07.2015).

All referral lettersof referred patients were used to record the cause of referral and the requested treatment from the GPs. All clarifications of patients who treated under N_2O/GAwere used to collect the sample.Themedical and dental files of all children who treated under N_2O/GA andthefilesoftherandomized sample (n=39) whotreatedunder BM had to be collected. The daily clinic calendar was used to measure the frequency of the visits.

For first group a total of 85 patients were selected for treatment under BM where 46 of them refereed from GPs and 39 were selected from the department, for second group a total of 82 patients were selected for treatment under N_2O where 40 patients were refereed from GPs and 42 were selected from the department while for third group a total of 86 patients were selected where 38 refereed from GPs and 48 were selected from the department.

All selected patients were within the age group 3-18 years and have received different types of dental treatments in our department. The first group involves patients who treated only under behavioral management (BM), the second group received treatment under nitrous oxide (N_2O) while the third group were treated under general anesthesia (GA).

The selection of the sample was different. The patients in the first group who received dental treatment under BM were selected when they didn't receive N_2O/GA neither in the first visit nor in the next follow-up visits. But for the other two groups, the methodology ignored any dental visits which had been done before the date of dental treatment which had been done certainly under N_2O/GA.

Variables

1. Dependent variables

For the purpose of this study different dependent variables were selected such as; Decayed Missing Filled Teeth (dmft/DMFT index), number of times attend to clinic for follow-up visits, treatment category in initial treatment visit, treatment category in first follow-up visit, treatment category in second follow-up visit, treatment type in initial treatment visit, treatment type in first follow-up visit, treatment type in second follow up visit and returned to the GP after treatment.

2. Independent variables

These variables included; age, gender, referral status, Medical complications/disabilities and travel distance.

Statistical analysis

All required data were coded and filled in Excel file and then converted to SPSS for data analysis where relevant analysis was conducted such; frequency, percentage, Mean, Chi Square test, T test and multiple logistic regression test. These different statistical tools were applied for the purpose of this study and to evaluate the correlation between the dependent and independent variables.

Flow chart of the study design for each of the three groups

All the children had been treated within the period from 07.2013 to 10.2014

BM group
N_2O group
GA group
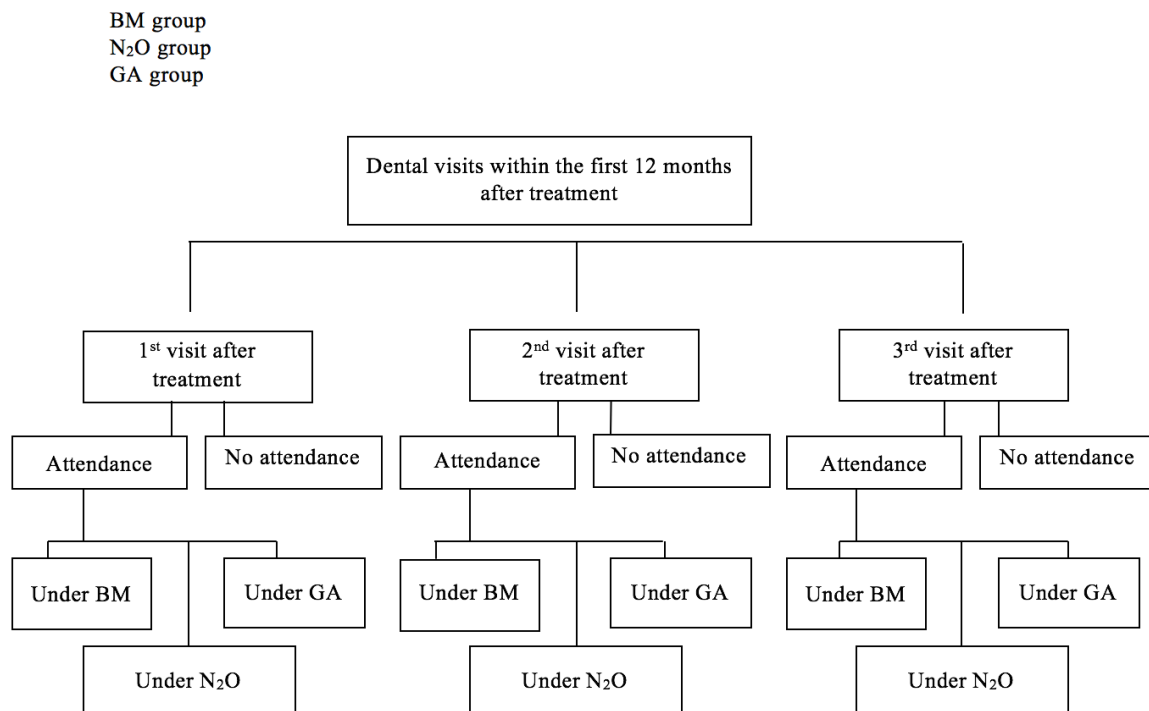
Inclusion criteria

- Age: 3-18 years

- All referred patients who attended our clinic in the period of study.

- For N$_2$O/GA groups, all the uncooperative patients who got invasive treatments under N$_2$O/GA.

- For control group, randomized patients from the daily calendar who got dental treatments underBM.

Criteria for the results

Regular attenders	Children who attended 2 times or more after treatment.
Irregular attenders	Children who attended only 1 time after treatment.
Non-attenders	Children who did not attend.

Risk assessment

In this study, the dental attendance has to be evaluated retrospectively after dental treatment. For this reason, no known risk will be taken.

Patient's clarification

Since the study is retrospective and the data handled anonymously, no further clarifications were needed.

Data protection

The permission to analyze the data was given by the head of the department of preventive and pediatric dentistry Prof. Ch. Splieth. Personal data underlie professional discretion. Therefore, all personal data used in this study will be made anonymous. The name of the patients will not be registered in the statistical file.

Quality protection

A back up of the data was made regularly on a safe device to avoid data loss due to technical failure during the period of study.

Clarification to apply another ethic commission

No other applications to other ethic commission were submitted.

Study limitations:

The most limitation of this study concerned with the role of latent inhibition with frequent painless dental visits cannot be obviously evaluated as we don't know the dental experience for the referred patients. In addition to the lack of detailed medical history for those referred to our clinic.

RESUTS:

Regarding to the gender distribution of patients 52 % were females, while 48 % were males.

Table 1: Gender distribution of patients in the study

Gender	n	%
male	136	53.8
female	117	46.2
Total	253	100.0

As shown in figure 1, the majority of patients who attend clinic within the preschool age group 54%, while others were within school age 46%.
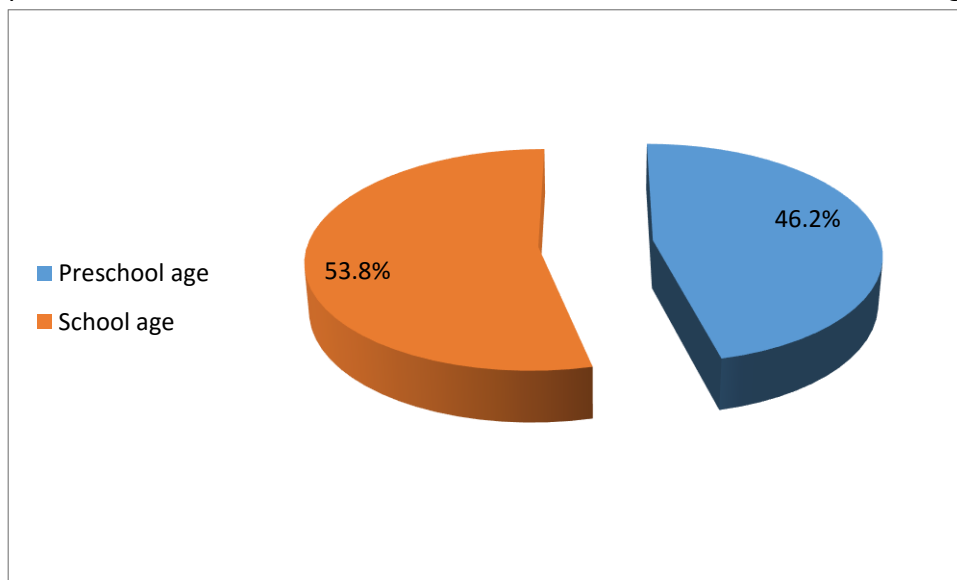

Figure 1: Age distribution of patients.

About 40% of preschool age and 30% of school age took treatment under BM, 23 % preschool age and 37% of school age took treatment under N_2O while 37% preschool age and 33% of school age took treatment under GA.

Table 2: Distribution of patients according to age group and treatment category.

Age group	Treatment category			
	Treatment under BM	Treatment under N_2O	Treatment under GA	Total
Preschool age	31(40%)	18 (23%)	29 (37%)	78
School age	52 (30%)	63(37%)	57(33%)	172
Total	83	81	86	250

Most of patients who treated under BM, N_2O and GA within the age group of 4-11 years old.
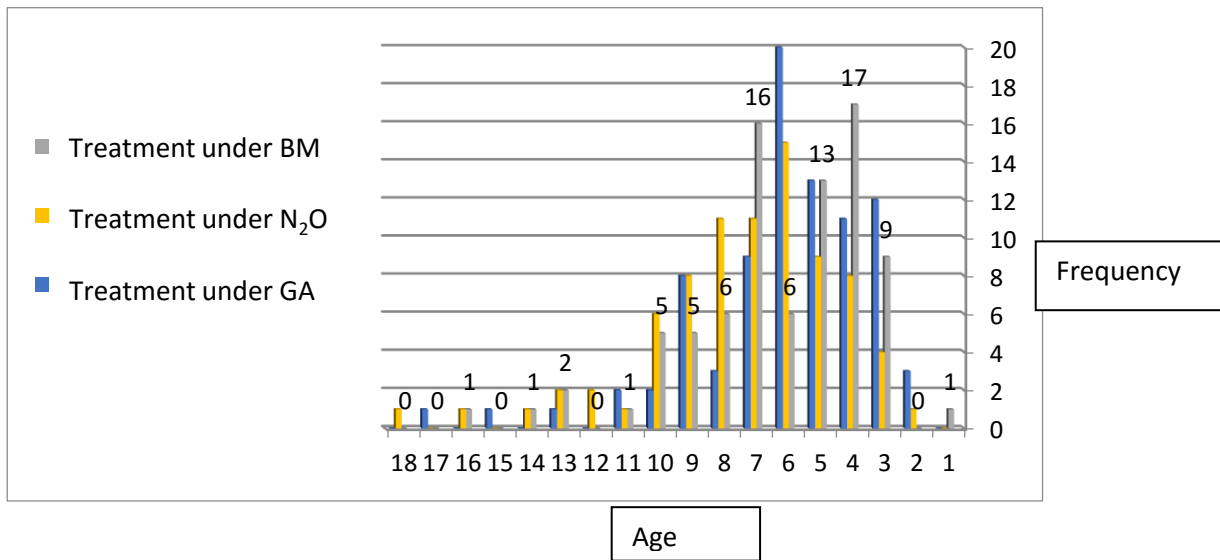
Figure 2: Age group and treatment categorydistribution of patients.

About 66% of patients who come from Greifswald and peripheral areas and 34% of patients who come from other places took BM, 67% of patients who come from Greifswald and peripheral areas and 33% of patients who come from other places took treatment under N$_2$Owhile about 59% of patients who come from Greifswald and peripheral areas and 41% of patients who come from other places took treatment under GA.

Table 3: Travel distance and treatment categorydistribution of patients.

Travel distance	Treatment category			
	Treatment under BM	Treatment under N$_2$O	Treatment under GA	Total
In Greifswald& peripheral areas	55 (65.5%)	55 (67.1%)	51 (59.3%)	161 (63.9%)
In other places	29 (34.5%)	27 (32.9%)	35 (40.7%)	91 (36.1%)
Total	84 (100.0%)	82 (100.0%)	86 (100.0%)	252 (100.0%)

Majority of patients who visited the clinic were healthy 82% while only18% were suffered other medical complications
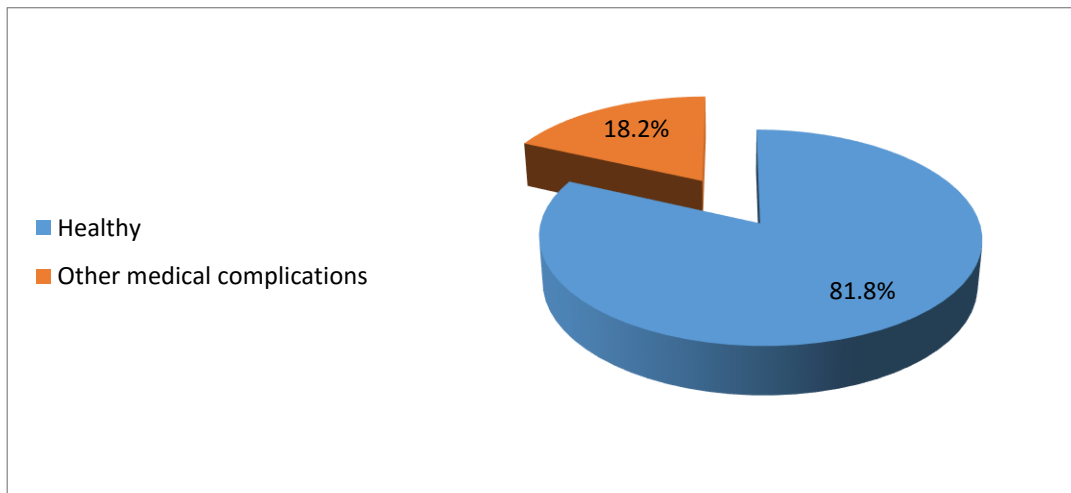
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Figure3: medical history distribution of patients.

Patients who had previous medical history get treatment under GA 46% while only 32% of patients who had no previous medical history get treatment under GA.

Table 3.1: Medical history and treatment category distribution of patients.

Medical History	Treatment category			Total
	Treatment under BM	Treatment underN_2O	Treatment under GA	
Healthy	69 (34%)	69 (34%)	65 (32%)	203
Previous medical history	14 (30%)	11(24%)	21(46%)	46
Total	83	80	86	249

There was statistically significant relationship between treatment category and medical history, P value < 0.05.

Table 3.2: Bivariate analysis for the association between treatment category and medical history.

Variable	Category	Medical history		Total	P Value
		Healthy	Not healthy		
Treatment category	Not GA	138 (68.0%)	25 (54.3%)	163	.05
	GA	65 (32.0%)	21 (45.7%)	86	
Total		203 (100%)	46 (100%)	249	

Patients who referred from GP or who were not referred seems to be equal, (49%) and51%.

Table4: Referral status distribution of patients.

Referral Status	Fr.	%
Not referred	129	50.6
Referred from GP	124	49.4
Total	253	100.0

Referral reason of general dentist of patients stated that 37% were for treatment under BM, 32% treated under N_2O and 31% treated under GA while patients who participated from the department showed that 30% were for treatment under BM, 33 % treated under N_2O and 37% treated under GA.

Table 5: Distribution of patients according to referred status and treatment category.

	Referred Patients		Not referred (department Patients)		Total
Treatment Category	n	%	n	%	
Treatment under BM	46	37	39	30	85
Treatment under N_2O	40	32	42	33	82
Treatment under GA	38	31	48	37	86
Total	124	100.0	129	100.0	253

About 46 cases were recommended to be treated under BM where only 21 were treated under BM,16 were treated under N_2O while 9 of them were treated under GA, about 40 cases were recommended to be treated under $N_2O$where about 9 were treated under BM, 19 were treated under N_2O while 12 of them were treated under GA and 38 cases were recommended to be treated under general anesthesia where about 11 were treated under BM, 7 were treated under N_2O while 20 of them were treated under GA.

*As requested 21 + 19 + 20 = 60 / 124 = 48% of patients were treated as requested by GP while 52 % of them are "reassigned" and get other type of treatment that differ than what mentioned by GP.

Table 6: Distribution of requested treatments and the actually performed treatments of referred patients.

Requested treatment inreferral letter	Actually performed treatment						Total
	Treatment under BM		Treatment under N_2O		Treatment under GA		
	n	%	n	%	n	%	
Referral for further	**21**		16		9		46

treatment without mentioning N_2O or GA		46		35		19	
Treatment under N_2O	9	23	**19**	47	12	30	40
Treatment under GA	11	29	7	18	**20**	53	38
Total	41			42		41 (33.1%)	124 (100%)

About 35% of preschool age and 65% of school age took treatment under BM, 24% preschool age and 76% of school age took treatment under N_2O while 32% preschool age and 68% of school age took treatment under GA .

Table 6.1: Distribution of patients according to age group and treatment category for referred patients.

Age group	Treatment category			Total
	Treatment under BM	Treatment under N_2O	Treatment under GA	
Preschool age School age	14 (35%)	10 (24.4%)	13 (31.7%)	37 (30.3%)
Total	26 (65%)	31 (75.6%)	28 (68.3%)	85 (69.7%)
	40 (100%)	41 (100%)	41 (100%)	122 (100%)

As demonstrated in this table near equal numbers of patients get treatment under BM, N_2O or GA, 34, 32 and 34.

Table 7: Distribution of patients according to treatment category in the initial visit.

Treatment category in the initial visit	n	%
Treatment under BM	85	33.6
Treatment under N_2O	82	32.4
Treatment under GA	86	34.0
Total	253	100.0

About 52% came for extraction, 25% for prevention services and 17% for filling or crown while only 6% for pulp.

Table 8: Type of treatment distribution of patients

Type of Treatment	n	%
Prevention	62	24.5
Filling or crown	42	16.6
Pulp	14	5.5
Extraction	131	51.8
others	4	1.6
Total	253	100.0

In the initial visit about 98% of patients who attend for prevention and 50% of patients who attend for filling or crown took only behavior management, 40% of patients who attend for filling or crown, 54% of patients who attend pulp and 43% of patients who attend for extraction took treatment under N_2O while only 10% of patients who attend for filling or crown, 46% of patients who attend pulp and 57% of patients who attend for extraction took treatment under GA.

Table 8.1 Distribution of patients according to the type of treatment and treatment category in the initial visit.

Treatment category	Type of treatment					Total
	Prevention	Filling or crown	Pulp	Extraction	others	
Treatment under BM	61(98%)	22 (50%)	0	0	2 (50%)	85
Treatment under N_2O	1(2%)	16(40%)	7 (54%)	56 (43%)	2 (50%)	82
Treatment under GA	0	5 (10%)	6 (46%)	75 (57%)	0	86
Total	62	43	13	131	4	253

About 46% of patients who attend for treatment under BM, 25% of patients who attend for treatment under N_2O and 29% of patients who attend for treatment under GA took prevention services in initial visit. About 48% of patients who attend for treatment under BM, 30% of patients who attend for treatment under N_2O and 22% of patients who attend for treatment under GA took filling or crown services in initial visit. About 63% of patients who attend for treatment under BM, 25% of patients who attend for treatment under N_2O and 13% of patients who attend for treatment under GA took pulp in initial visit. While 25% of patients who attend for treatment under BM, 37% of patients

who attend for treatment under N_2O and 37% of patients who attend for treatment under GA took extraction in initial visit.

Table 8.2: Distribution of patients according to the cause of reference and type of treatment in the initial visit.

Cause of reference	Type of treatment in initial visit					Total
	Prevention	Filling or crown	Pulp	Extraction	others	
Treatment under BM	13	13	5	15	0	46
	46.4%	48.1%	62.5%	25.4%	.0%	37.1%
Treatment underN_2O	7	8	2	22	1	40
	25.0%	29.6%	25.0%	37.3%	50.0%	32.3%
Treatment under GA	8	6	1	22	1	38
	28.6%	22.2%	12.5%	37.3%	50.0%	30.6%
Total	28	27	8	59	2	124
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Most of patients 76% were not returned back to general dentist while only 24% were returned back.

Table 9: Distribution of patients according to returned status to general dentist after treatment.

Returned after treatment	n	%
Not returned to general dentist	90	75.6
Returned to general dentist	29	24.4
Total	119	100.0

75%of patients came to clinic back two times or more, 13% came back only one time while about 12% not came back at all.

Table 10:Distribution of patients according to their attending to clinic after treatment for follow-up visits.

Attending to clinic after treatment	n	%
Never attended after treatment	30	11.9

Attended after treatment only one time	33	13.0
Attended after treatment two times or more	190	75.1
Total	253	100.0

When comparing the treatment category with number of times attended for follow-up visits 93% of patients who get treatment under behavior management came back for follow-up visits more than two times, 75% who get treatment under N_2O came back for follow-up visits more than two times while only 57% of patients who get treatment under general anesthesia came back for follow-up visits more than two times.

* There was strongly statistically significant relationship between treatment category in the initial treatment visit and the number of times attended for follow-up visits (P Value <0.01. patients who get treatment under BM were more willing to come back than patients who treated under N_2O or GA.

Table 10.1: Number of times attended for follow-up after initial treatment visit.

Treatment category in the initial visit	Attended after treatment				P. Value
	Never attended after treatment	Attended after treatment only one time	Attended after treatment two times or more	Total	
Treatment underBM	1 (1%)	5 (6%)	79 (93%)	85	0.000
Treatment under N_2O	13 (16%)	7 (9%)	62 (75%)	82	
Treatment under GA	16 (19%)	21 (24%)	49 (57%)	86	
Total	30	33	190	253	

Only7% of male never attend while females were 17%, also male who attend more than two times were about (80%) while female were only 70%.

* There was statistically significant relationship between gender and Attending after treatment (P Value = 0.05), male more attending for follow-up than female.

Table 10.2: Compare the gender with the number of times attended for follow-up.

Attended after treatment	gender			P Value
	male	female	Total	

Never attended after treatment	10 (7%)	20 (17%)	30	0.05
Attended after treatment only one time	18 (13%)	15 (13%)	33	
Attended after treatment two times or more	108 (80%)	82 (70%)	190	
Total	136	117	253	

As mentioned in this table, the type of treatment for all patients in their 1st follow-up visit represented that about 33% were came for prevention services, 27% for other services, 22%for filling or crown and about 7%for Extraction, only 1% for pulp therapy while 12% not attend for 1st follow-up visit.

Table 11: Distribution of patients according to the type of treatment in the 1st follow-up visit.

Variable	n	%
Prevention	80	32.6
Filling or crown	56	22.1
Pulp	3	1.2
Extraction	18	7.1
Others	68	26.9
Not attend	29	11.5
Total	253	100.0

Most of patients81%were treated under BM, 7% were got treatment under N_2Owhile 12% were not attend for follow-up.

Table 12: Distribution of patients according treatment category in the 1st follow-up visit.

Treatment category	n	%
Treatment under BM	206	81
Treatment under N_2O	17	7
Not attend	30	12
Total	253	100.0

98% of patients who treated under BM in initial visit, 78% of patients who treated under N_2O and 100% of patients who treated under GA treated under BM in 1st follow-up visit while only 2% of patients who treated under BM and 22% of patients who treated under N_2O in initial treatment visit took treatment under N_2O in the 1st follow-up visit.

* There is strong statistical significant relationship between who treated under

BM and coming back for 1st follow-up visit (P Value is < 0.01).

Table 12.1: Distribution of patients according to treatment category in the initial treatment visits and treatment category in the 1st follow-up visit.

Treatment category in the initial treatment visit	Treatment category in 1st follow-up visit		Total	P Value
	Treatment under BM	Treatment under N_2O		
Treatment under BM	82(98%)	2(2%)	84	0.000
Treatment under N_2O	54 (78%)	15(22%)	69	
Treatment under GA	70(100%)	0	70	
Not came back			30	
Total	206	17	253	

97% of patients who treated under BM, 87% of patients who treated under N_2O and 98% of patients who treated under GA in initial visit treated under BM in 2nd follow-up visit, while only 3% of patients who treated under BM, 13% of patients who treated under N_2O in initial treatment visit took treatment under N_2O and 2% of patients who treated under GA in the 1st follow-up visit took treatment under N_2O in 2nd follow-up visit while there were no cases treated under GA in 2nd follow-up visit.

* There is statistical significant relationship between who treated under BM and coming back for 2nd follow-up visit (P Value is < 0.05).

Table 12.2: Distribution of patients according to treatment category in the initial visit and treatment category in the 2nd follow-up visit.

Treatment category in the initial visit	Treatment category in 2nd follow-up visit			Total	P Value
	Treatment under BM	Treatment under N_2O	Treatment under GA		
Treatment under BM	77(97%)	2(3%)	0	79	0.025
Treatment under N_2O	52 (87%)	8 (13%)	0	60	
Treatment under GA	48 (98%)	1(2%)	0	49	
Not came back				65	

Treatment category in the initial visit	Treatment category in 2nd follow-up visit			Total	P Value
	Treatment under BM	Treatment under N_2O	Treatment under GA		
Treatment under BM	77(97%)	2(3%)	0	79	0.025
Treatment under N_2O	52 (87%)	8 (13%)	0	60	
Treatment under GA	48 (98%)	1(2%)	0	49	
Not came back				65	
Total	177	11	0	253	

In the first follow-up visit from different groups of patients 31% took prevention services, 22% took filling or crown, 1% took pulp, 7% took extraction while 27% took other services.

Table 12.3: Distribution of patients according to the treatment category in initial visit and type of treatment in the 1st follow-up visit.

Treatment category in the initial visit	Type of treatment in the 1st follow-up visit					Total
	Prevention	Filling or crown	Pulp	Extraction	others	
Treatment underBM	24	34	2	6	18	84
Treatment under N_2O	19	19	1	11	20	70
Treatment under GA	36	3	0	1	30	70
Not attend						30
Total	79 (31%)	56 (22%)	3 (1%)	18 (7%)	68 (27%)	253

In the second follow-up visit from different groups of patients 47% took prevention services, 27% took filling or crown, 3% took pulp, 8% took extraction while 15% took other services.

Table 12.4: Distribution of patients according to the treatment category in initial visit and type of treatment in the 2nd follow-up visit.

Treatment category in the initial visit	Type of treatment in 2nd visit					Total
	Prevention	Filling or crown	Pulp	Extraction	others	
Treatment under BM	28	33	0	8	10	79
Treatment under N$_2$O	30	11	6	5	8	60
Treatment under GA	30	7	0	2	10	49
Total	88 (47%)	51 (27%)	6 (3%)	15 (8%)	28 (15%)	188

* When comparing gender with dmft/DMFT or returned after treatment to GP there was no statistically significant relationship P value > 0.05 but there was statistically significant relationship between gender and number of times attended after treatment for follow-up visits, P value is 0.05.

* When comparingage with dmft/DMFT, returned after treatment to GP or number of times attended after treatment for follow-up visits there was no statistically significant relationship P value > 0.05.

* When comparing travel distance with returned after treatment to GP or number of times attended after treatment for follow-up visits there was no statistically significant relationship P value > 0.05 but there was statistically significant relationship between travel distance and dmft/DMFT, P value < 0.05.

Table13: Multiple logistic regression test comparing gender, age and treatment distance with dmft/DMFT, returned after treatment to GP and numberof times attended after treatment for follow-up.

Variables	P Value	Point Estimate of OR	95% Wald Confidence Limits	
Gender			Lower	Upper
gender* dmft/DMFT	.547	1.003	.601	1.675
gender * returned after treatment to GP	.319	.747	.757	.931
gender * numberof times attended after treatment	.05	1.002	.662	1.247

for follow-up				
Age				
age * dmft/DMFT	.297	.838	.497	1.412
age * numberof times attended after treatment for follow-up	.681	.914	.701	1.193
Age * returned after treatment to GP	.073	.488	.208	1.140
Travel distance				
Travel distance * dmft/DMFT	.020	1.818	1.061	3.117
Travel distance * numberof times attended after treatment for follow-up	.142	.833	.664	1.044
Travel distance * returned after treatment to GP	.067	2.089	.894	4.881

* There was no statistically significant relationship between gender with dmft/DMFTandreturnedaftertreatment to GP, P value > 0.05.

* There was statistically significant relationship between gender and number of times attended after treatment for follow-up, P value <0.05, female attended more than male.

Table 13.1: Bivariate analysis investigating the association between gender and other variables such as dmft/DMFT,number of times attended after treatment for follow-up andreturnedaftertreatment to GP.

Variable	Category	dmft/DMFT category			P Value
		< 7	> 7		
	Male	54 (50.5%)	53 (49.5%)		.547
	Female	65 (50.4%)	64 (49.6%)		
Gender		**Number of times attended after treatment for follow-up**			
		One	**Two**	**Three**	
	Female	20 (17.1%)	15 (12.8%)	82 (70.1%)	.05
	Male	10 (7.4%)	18	108	

		(13.2%)	(79.4%)		
	Returnedaftertreatment to GP				.319
		Yes	**No**		
Male		40 (72.7%)	15 (27.3%)		
Female		50 (78.1%)	14 (21.9%)		

* There was no statistically significant relationship between age and other variables such as dmft/DMFT, number of times attended after treatment for follow-up and returned after treatment to GP P value > 0.05.

Table 13.2: Bivariate analysis investigating the association between age and other variables such as dmft/DMFT,numberof times attended after treatment for follow-up and returned aftertreatment to GP.

Variable	Category	dmft/DMFT category			P Value
		< 7	> 7		.297
	Pre school	45 (47.4%)	50 (52.6%)		
	School	72 (51.8%)	67 (48.2%)		
Age		**Number of times attended after treatment for follow-up**			
		One	**Two**	**Three**	.681
	Pre school	10 (9.9%)	13 (12.9%)	78 (77.2%)	
	School	20 (13.4%)	20 (13.4%)	109 (73.2%)	
		Returned after treatment to GP			.073
		Not returned to GP	**Returned to GP**		
	Pre school	33 (67.3%)	16 (32.7%)		
	School	55 (80.9%)	13 (19.1%)		

* There was no statistically significant relationship between travel distance and other variables such as number of times attended after treatment for follow-up and returned after treatment to GP, P value > 0.05.

* There was statistically significant relationship between travel distance and dmft/DMFT, P value < 0.05.

Table 13.3: Bivariate analysis investigating the association between travel distance and other variables such as dmft/DMFT, numberof times attended after treatment for follow-up and returned after treatment to GP.

Variable	Category	dmft/DMFT category			P Value
		< 7	> 7		.020
	Greifswald&Peripheral areas	84 (56.0%)	66 (44.0%)		
	Other places	35 (41.2%)	50 (58.8%)		
		Numberof times attended after treatment for follow-up			
Travel distance		**One**	**Two**	**Three**	.142
	Greifswald&Peripheral areas	20 (12.4%)	16 (9.9%)	125 (77.6%)	
	Other places	10 (11.0%)	17 (18.7%)	64 (70.3%)	
		Returnedaftertreatment to GP			.067
		Yes	**No**		
	Greifswald&Peripheral areas	56 (81.2%)	13 (18.8%)		
	Other places	33 (67.3%)	16 (32.7%)		

The mean number of dmft/DMFT was 7.0, about 50% of patients had less than 7 dmft/DMFT while another 50% had more than 7.0 dmft/DMFT.

Table 14:Distribution of dmft/DMFT status of patients.

	Frequency	Percent	Valid Percent	Cumulative Percent
7 or less	119	47.0	50.4	50.4

More than 7	117	46.2	49.6	100.0
Total	236	93.3	100.0	
Missing System	17	6.7		
Total	253	100.0		

* Mean = 7.0 SD = 4.0

DISCUSSION:

This retrospective study was conducted at the Department of Preventive and Pediatric Dentistry at the University of Greifswald from July 2013 up to October 2014 to observe and analyze the factors that may be correlated to children's adherence to regular dental attendance.

For the purpose of this study and as shown in table 1, 2, 3 and figure 1, about 253 patients who visited the department clinic during the period of study were selected for patients. All selected patients were within the age group of 3 to 18 years old, 52% were female while 48% were male, 54% of patients were preschool age while 46% were within school age, 64% of patients who visited the clinic were from Greifswald and peripheral areas while only 36% were from other places. This study focuses on both preschool and school aged patients specifically because the dentalcaries in the primary dentition could lead to further caries in the permanent dentition, and there is few to no previous studies that focus on the dental services for preschooland school children.

As shown in tables 3.1 and3.2, themajority of patients, 82%, who visited

the department were healthy while only 18% had prior medical history. In addition, 46% of patients who had prior medical history received treatment under general anesthesia while only 32% of patients who had no prior medical history received treatment under general anesthesia. Also this study finds that there is statistically significant relationship between a patient's treatment category and his medical history, P value < 0.05where more patients with prior medical history or disability were treated under GA than patients with no prior medical history (46% and 32%, respectively).These findings are supported byKvist et al.(2014) who concluded that the majority of the neglected children or who have disabilities were treated under GA.

As shown in table 4, the number ofpatients who were referred bygeneral practitioners (GPs) or who were not referred seemed to be equal, (49% and 51% respectively).As shown in table 5, the referral reasons from GPs for patients shows that 37% of referral cases were for treatment under BM, 32% for treatment underN_2O,and 31%for treatment under GA. Also, 48% of referred patients were actually treated

according to the requested treatment from GPs (21 + 19 + 20 = 60 / 124 = 48%).

As shown in table 6,52% of referred patients were "reassigned" and received other type of treatments that differ from what mentioned by GPs, neara half,48%, were actually treated under GA as requested in the referred letter but the remaining patients were treated under BM. These different decisions show the gap between the GPs and the specialists in diagnosis, evaluation of the dental anxiety and then the treatment plan. This changemaybe due to ourdepartment's approach which gives more attention on the behavioural management (BM) of each patient by planing multiple non-invasive appointments for those who were able to engage in the treatment. These findings are also supported by (Alkilzy in 2014) who stated that about 53% of the referred children for Full Oral Rehabilitations under General Anesthesia (FORGA) in 2008 were treated actually on dental chair with BM. This study also concludes that the number of patients requiring treatment under general anesthesia was 33.1%, which increased significantly comparedto previous studies; 6.8% in 1995 and 20.1% in 2008 (Alkilzy et al., 2014).As shown in table 6.1, about 35% of preschool age patients and 65% of school age received treatment under BM, 24% of preschool age and 76% of school age received treatment under N_2O while 32% of preschool age and 68% of school age received treatment under GA.As demonstrated in table 7, near

equal numbers of patients received treatment under BM, N_2O or GA, 34%, 32% and 34%, respectively, these were due to the methodology of this study.

As indicated in table 8, about 52% of patients came for extraction, 25% for prevention services and 17% for filling or crown while only 6% for pulp.As shown in table 8.1, in the initial visit, about 98% of patients who visited for prevention and 50% of patients who visited for filling or crown received only behavioral management. About 40% of patients who visited for filling or crown, 54% of patients who visited for pulp therapy and 43% of patients who visited for extraction received treatment under N_2O.About10% of patients who visited for filling or crown, 46% of patients who visited for pulp therapy and 57% of patients who attend for extraction took treatment under GA.When comparing this study's findings with a local previous study, the vast majority of referred patients in that previous study were not treated invasively during the initial visit (77.9% and 78.8% and 74.1% in 1995, 2008 and this study 2015 respectively), indicating the importance of diagnosis, treatment planning, and achieving informed consent. Also regarding the type of treatment and according to Alkilzy in 2014, the frequency of dental extractions carried out during the first visit dropped from 7.9% to 5.0% between 1995 and2008.

As shown in table 8.2, which demonstrates referral reasons from GPs and actual treatment in the initial visit,

about 46% of patients who were referred for treatment under BM, 25% of patients who were referred for treatment under N_2O and 29% of patients who were referred for treatment under GA took prevention services in initial visit. About 48% of patients who were referred for treatment under BM, 30% of patients who were referred for treatment under N_2O and 22% of patients who were referred for treatment under GA received filling or crown services in initial visit. About 63% of patients who were referred for treatment under BM, 25% of patients who were referred for treatment under N_2O and 13% of patients who were referred for treatment under GA took pulp in initial visit. While 25% of patients who were referred for treatment under BM, 37% of patients who were referred for treatment under N_2O and 37% of patients who were referred for treatment under GA received extractions in initial visit.

As demonstrated in table 9, most of the patients, 76%, who were referred from GPs did not return back to GPs, while only 24% returned back. Therefore, we recommend that more coordinating efforts should be taken by specialized dental clinics and GPs clinics, and we also recommend that there should be clear instructions or guidelines to be followed by GPs to minimize this gap in patients' attendance.

As shown in table 10, about 75% of patients came back to the clinic two times or more, 13% came back only one time while only 12% did not come back at all; but when comparing the treatment category with the number of visits for follow-up as shown in table 10.1, 93% of patients who received treatment under BM came back for follow-up visits more than two times, 75% of patients who received treatment under N_2O came back for follow up visits more than two times, while only 57% of patients who received treatment under GA came back for follow up visits more than two times.This study also concludes that there is a strong statistically significant relationship between the treatment category in the initial visit and the number of visits for follow-up (P Value <0.01. patients who received treatment under BM were more willing to come back than patients who were treated under N_2O or GA.

So from the findings of this study, as mentioned in table 10.1, we observe that patients who were treated under BM had a higher attendance rate for follow-up visits than the other two groups; also, patients who were treated under N_2O had a higher attendance rate for follow-up visits than GA group (93%, 75%, and 57%, respectively).This difference in attendance may illustrate that the use ofBM or N_2O could enhance the attitude of the anxious patient and encourage him to attend the preventive care later or even the invasive treatment but still BM has a stronger effect as shown in this study. For this reason, more than half of the patients who received N_2Odid not need the sedation in the first follow-up

visit during the period of this study.In 2010, Peter concluded that anxious patients who had received N_2O were more motivated and able to overcome their fear and attend the dental clinic. Therefore, treatment under N_2O seems to be more motivating for those anxious patients.However, our findings do not agree with what Jeffrey et al. concluded, in 1987, that there is no difference between children who were treated under N_2O and those who were treated under general anesthesia, but he did not consider attendance patterns and focused only on the feelings of the children and mothers after treatment, which could be considered as a predictor for the attitude to the dentist. We also observe, as shown in table 10.1, that frequent painless treatments have an effect on reducing dental anxiety since most of the initial treatments in the BM group were painless treatments, which weakened the association of the conditional stimuli and the unconditional stimuli CS-UCS. This UCS could be reevaluated with frequent painless treatments and thus reducing dental anxiety. Another study conducted by Graham in 1988 reveal that the less painful the dental treatment is, the less the dental anxiety will be for patients. In the study, the group of patients who transferred from the anxious group to the relaxed group had frequent painless treatments while the group that transferred from the relaxed to the anxious had frequent traumatic treatments. Since the intensity of the fear is determined by the number of

repetitions of the association of pain/fear and the stimuli, our approach in the department depends on weakening this association by the frequent repetition of painless treatments.

As shown in table 10.2, when comparing the gender with number of follow-up visits, only7% of males never showed up whileit was 17% for females; also, males who visited more than two times were about 80%, while females were only 70%; in addition, there was a statistically significant relationship between gender and attendance after treatment: males were more attending for follow-ups than females, (P Value = 0.05).These variations in attendances for follow-up visits between males and females may be because females fear dentists or dental treatments more than males, or may be because of another underlying reasons. Deeper analysis is not covered in our study, but referring to some previous studies, Carrillo in 2012 found that girls tend to go through dental treatments in a more catastrophic way than boys do; also, Hmud in 2009 concluded that the prevalence rates for dental anxiety for females were more than those for males.

As shown in table 11, which shows the types of treatment for all patients in their first follow-up visit, about 33% came for prevention services, 27% for other services, 22%for fillings or crowns, about 7%for extractions, only 1% for pulp treatment, and 12% did not attend their first follow-up visit. However, when

comparing the treatment categories in the first follow-up visit, the majority of patients, 81%, were treated by behavioral management, 7% were treated under N_2O, while 12% did not attend for follow-up (table 12).This study also finds that 98% of patients who were treated under BM in the initial visit, 78% of patients who were treated under N_2O and 100% of patients who were treated under GA were treated under BM in first follow-up visit, while only 2% of patients who were treated under BM and 22% of patients who were treated under N_2O in initial treatment visit took treatment under N_2O in the 1st follow-up visit (table 12.1).Also according to the findings of this study, 97% of patients who were treated under BM, 87% of patients who were treated under N_2O, and 98% of patients who were treated under GA in the initial visit were treated under BM in second follow-up visit; while only 3% of patients who were treated under BM and 13% of patients who were treated under N_2O in the initial visit received treatment under N_2O; and 2% of patients who were treated under GA in the first follow up visit received treatment under N_2O in second follow-up visit, while there were no cases treated under GA in second follow up visit (table 12.2).

In the first follow-up visit from different groups of patients, 31% received prevention services, 22% did fillings or crowns, 1% did pulp treatment,7% did extractions, while 27% received other services (table 12.3).In the second follow-up visit from different groups of patients, 47% received prevention services, 27% did fillings or crowns, 3% did pulps, 8% did extractions, while 15% received other services (table 12.4).

As shown in tables 13, 13.1, 13.2, 13.3 and 13.4, which show multiple logistic regression tests and Bivariate analyses that investigate the association between dmft/DMFT and gender, age and travel distance, returned after treatment to GP and number of times attended after treatment for follow-up visits, this study found that; there was no statistically significant relationship P value > 0.05, but there was statistically significant relationship between gender and number of times attended after treatment for follow-up visits, P value is 0.05. It also found that there was no statistically significant relationship when comparing age with dmft/DMFT, returned after treatment to GP or number of times attended after treatment for follow-up visits, P value > 0.05. Again this study demonstrated that there was no statistically significant relationship when comparing travel distance with returned after treatment to GP or number of times attended after treatment for follow-up visits P value > 0.05 but there was statistically significant relationship between travel distance and dmft/DMFT, P value < 0.05.The findings of this study show the high percent of caries in the preschool age. Those findings were similar to those of Hallett, in 2003,who found a high caries percent in the preschool age. The main risk factor for severe early childhood caries ECC was sleeping with a bottle (Hallett 2003).

Also,Rourke,(2006)has found a high percent of dmft in early childhood caries for referred children. As shown in table 14, which highlights the distribution of patients who participated in this study, according to dmft/DMFT mean, the mean number of dmft/DMFT was 7.0 where about 50% of patients had less than 7.0 while the other 50% had more than 7.0.As mentioned by Alkilzyet al. in 2014,the mean dmft of the referred children increased from 2.4 in 1995 to 4.1 in 2008, while in this study it is equal to 7; so there was clear increase since 1995 by almost three times. It is also mentioned that the maximum value of 14 affected teeth in 1995 was clearly exceeded by 20 teeth in 2008. The number of decayed primary teeth (dt) increased significantly from 2.3 in 1995 to 3.7 in 2008. In the permanent dentition, the mean DMFT of the referred patients sank from 1.4 to 0.9 (1995 and 2008, respectively).

CONCLUSION

This retrospective study provides a description of attendance for patients within 3-18years old who visited the clinic at the Department of Preventive and Pediatric Dentistry at the University of Greifswald from July 2013 up to October 2014. We observe and analyze the factors that may be related to children's adherence to regular dental attendance, and we compare age, gender, type and category of treatment with children's attendance for follow-up visits.

Recommendations

1. A longitudinal prospective study would certainly be useful to clarify relationships among variables, and especially to identify how the treatment category (BM, N_2O or GA) can affect attendance patterns for treatment and follow-up visits.

2. Encouraging the anxious patients to overcome their dental fear by frequent preventive treatments and regular check-ups.

3. Give special attention for those attending on a non-regular by promoting a child's familiarity with dental instruments or extending the time before and after a dental intervention (e.g. chatting with the patient).

4. Establishing an electronic medical record system to get more information on children who were referred by GPs and other clinics.

5. It is important for dental care professionals to be trained to deal with uncooperative children and to identify and reduce negative thoughts by giving children an idea on treatment procedures during sessions.

6. Encourage all GPs to start with behavioral management services for all children unless they need N_2O/GA.

7. Conducting periodic training for GPs to increase their skills in conducting more investigations before referring to specialized dental clinics and train them to deal with anxious children.

8. Encourage GPs to conduct more frequent dental visits to decrease children's fear levels through habituation or other cognitive processes, as children exhibiting higher anxiety levels could be more likely to avoid going to the dentist.

9. Dentists could decisively contribute to reducing children's dental anxiety by taking into account their expectancies during treatments, providing them with realistic information, and discouraging biased negative thoughts. This is expected to let the child gain positive perceptions of the dental environment.

10. Further studies needed for anxious children who are able to overcome their anxiety to evaluate the prior dental experience and the effect of frequent painless dental treatments (role of latent inhibition) for different age groups.

11. Further studies needed to estimate the effects of socioeconomic, behavioral, and health characteristics on dental service visits among the three treatment categories.

12. Properly designed prospective clinical trials are needed to determine the relative efficacy of N_2O compared to other treatments in reducing anxiety.

13. Conduct more studies to know the underlying factors behind the increase of dmft/DMFT average from 1995 until 2015.

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