

ONYCHOPHAGIA ASSOCIATE WITH BACTERIA INFECTION AMONG SCHOOL CHILDREN AND TEENAGERS IN NNEWI METROPOLIES

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ABSTRACT

Background: Microbial infection associated with chronic nail biting behavior affecting great percent of teenagers in general population. This habit can result in autoinoculation of pathogens and transmission of infection between body parts. **Objective:** The purpose of the study was to determine the oral carriage of Enterobacteriaceae among school children and young adults with chronic nail biting habit in Nnewi, Anambra state. **Methodology:** The study was a comparative cross-sectional microbiological study, conducted on the saliva samples of 70 chronic nail biting subjects and 30 subjects without chronic nail-biting habit with age ranging from 9-25 years. Ethical approval was sought from the ethics committee of Faculty of Health science and Technology, Nnamdi Azikiwe University, Nnewi Campus. The saliva samples were processed in the laboratory according to the standard microbiological methods under very strict complete aseptic conditions. Obtained data was analysed using Pearson Chi-square. **Results:** Two species of bacteria were recovered in the study, *Escherichia coli* (56.4%), *Klebsiella species* (43.6%). The prevalence of Enterobacteriaceae in chronic nail biting subjects were significantly higher than that of non-nail biters. Higher prevalence of Enterobacteriaceae was also seen in males (88.4%) than females (63.0%). **Conclusion:** The study showed that anxiety, poor hygiene, not having a personal clipper, ignorance of the harmful effects of nail-biting, boredom, bad habit, dirty environment, habitual nail-biting and stress are risk factors that tend to increase the chances of onychophagia. Key words: *Klebsiella species*, *Escherichia coli*, onychophagia.

Onychophagia or nail biting is an oral compulsive behavioural disorder particularly common in children and young adults. It is sometimes described as a parafunctional activity, the common use of the mouth for an activity other than speaking, eating, or drinking. It is a common form of habitual body manipulation which can be an expression of tension. Its prevalence is estimated to be between 6 to 45%. Although habitual nail biting is often considered to be harmless and wanes off as age advances, infrequently they have been associated with a range of psychological, dental, systemic infections and diseases.^[1] Nail Biting can also be defined as the crossing of any digit from an individual's lips. Operational definition of nail biting is "putting one or more fingers in the mouth and biting on nail with teeth".^[2]

Harmful impacts of the chronic nail biting habits are infections, gum bleeding, cuticle bleeding, and teeth related concern which cannot be neglected.^[3] It seems to

be a repetitive compulsion that can cause destruction of nail.^[4] In addition, children are not well toilet trained; they may not wash their hands or may have poor hand hygiene practices after attending toilet, thus nail-biting can be reason for entry of bacteria through mouth and also the high risk for developing infections in oral cavity.^[5]

Nail biting is often limited to fingernails, and most of the individuals with this habit do not have any preference for biting any of the fingernails. They usually do it when they are nervous, stressed, hungry, or bored. All of these situations have a common phenomenon between them, anxiety. Onychophagia is also a sign of other emotional or mental disorders. It can be a source of guilt and shame feelings in the nail biter, a reduced quality of life, and increased stigmatization in the inner family circles or at a more societal level.^[5]

Nail biting is one of the bad oral habits adopted by school children. It does not have negative impact at early stage however; latter on it may lead to emotional, dental or medical health related concerns.^[4] Nail biting starts at the age of 3 to 4 years, worsens 5 to 6 years but reduces in adolescence. At the beginning, people do not take it seriously, but with the passage of time it converts into chronic habits.^[6] As habit changes into chronic oral habit, it begins to have lasting effects on quality of life in school going children.^[7] The severe cases of nail biting may cause significant physical, psychological and emotional impacts on quality of life.^[1] Nail biters cannot stop themselves from biting their nails even in public, and feel social embracement when they interact with people.^[3]

The oral cavity has a higher susceptibility to infection and trauma in patients with chronic compulsive nail biting. This population is known to have a higher bacterial burden, specifically Enterobacteriaceae.^[8] In addition, this was aimed at evaluating the oral carriage of Enterobacteriaceae among school children and young adults with chronic nail biting habit.

MATERIALS AND METHODS

Study design

The study was carried out using a comparative cross-sectional microbiological technique. The study was conducted on the saliva samples of 70 chronic nail-biting subjects and 30 subjects without nail-biting habit aged 9-25 years. Samples were collected using an oral rinse technique.

The research was carried out over a period of three months from March, 2021 to June, 2021.

Study area

The study was carried out in some primary and secondary schools in Nnewi and also in the College of Health Sciences, Nnamdi Azikiwe University Nnewi Campus.

Nnewi is the second largest business city in Anambra state after Onitsha. It is made up of four villages (subtowns) which includes Otolo, Uruagu, Umudim and Nnewichi. Its Local Government Area is Nnewi North.

Inclusion Criteria

The inclusion criteria used for this study were primary and secondary students and students of College of Health Sciences, Nnamdi Azikiwe University Nnewi Campus that are nail biters and non-nail biters.

Exclusion Criteria

The exclusion criteria used are Nnewi school students who were uncooperative and/or apprehensive, who had other oral habits, who had recently suffered or were currently suffering from any medical illness, and who were presently on antibiotic therapy or using antiseptic mouthwash/rinse.

Ethical consideration

Ethical approval was sought from the ethics committee of Faculty of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi Campus, before the commencement of the study.

Informed consent

Informed consent was sought from the Headmistress/Headmasters and Principals in charge at each of the primary and secondary schools used for the study.

Sample collection and processing

A sterile sample collection bottle containing 10 ml of sterile water was given to each subject. Subjects were instructed to rinse their mouth for 60s using the sterile water after which they expectorated the rinse back into the containers that were labeled with their details. These samples were then transported to the laboratory, where the samples were transferred into sterile test tubes and centrifuged, each supernatant was discarded, and each deposit was resuspended to obtain a concentrated rinse. One loop full of concentrated rinse was inoculated on MacConkey agar culture media using standard streak plate method and also specimen was suspended in Selenite F broth. The plates were incubated at 37°C.

After 18 hours, one loop full of overnight broth from the Selenite F was subcultured into Salmonella-Shigella agar (SSA) and incubated. After 24 hours of incubation, the culture plates were taken out from the incubator and examined for growth of non-lactose fermenting colonies. For the MacConkey agar, after 24 hours of incubation, the culture plates were taken out from the incubator and examined for growth. The lactose fermenting colonies appeared pink in color and non-lactose fermenting colonies were pale in color.

Colonies from both MacConkey agar and Salmonella-Shigella agar were picked using wire loop. Smears were prepared and stained with Gram's stain and examined under microscope for gram negative bacilli. The gram negative bacilli were examined further using biochemical tests (Indole, Urease, Citrate utilization, Motility test and Kligler Iron Agar) for identification of specific group of *Enterobacteriaceae* (Cheesbrough, 2010).

Statistical Analysis

The data was statistically analyzed using Statistical Package for the Social Sciences (SPSS) statistical software. Two-tailed chi-square test was used to assess the difference in presence of Enterobacteriaceae in nail biters and non-nail biters.

RESULTS

This showed that out of 25 test samples collected from primary school pupils, 22 (88%) showed growth of bacteria while 3 (12%) failed to yield any growth of bacteria. From the secondary school students, data showed that of 25 samples collected, 16 (64%) were

positive for growth of Enterobacteriaceae while 9 (36%) yielded no growth of the bacteria. Out of 20 test samples collected from young adults, 17 (85%) positive growth and 3 (15%) negative growth were recorded. Furthermore, result showed that out of 10 control samples collected from primary school pupils, 8(80%) had no growth of bacteria and only 2 (20%) had positive growth. In secondary school students, of 10 control samples collected, 7 (70%) were negative for growth and 3 (30%) were positive for growth of Enterobacteriaceae. In young adults, while 6 (60%) yielded no growth of the bacteria, 4 (40%) yielded growth of Enterobacteriaceae (Table 1).

In the primary study group, prevalence of *Klebsiella* species was highest 14 (63.63%) and *Escherichia coli*

was least 8(36.36%) while in the control group, *Escherichia coli* was not isolated whereas 2 (100%) of *Klebsiella* species were isolated. In secondary school study group, of 16 isolates, 9 (56.25%) were *Escherichia coli* and 7 (43.75%) were *Klebsiella* species while in the control group, 2 (66.67%) isolates of *Klebsiella* species and 1 (33.33%) isolate of *Escherichia coli* were recorded. On the other hand, *Escherichia coli* had the highest prevalence in young adults study group with a total of 13 (76.47%) isolates while *Klebsiella* species had the least with a total of 4 (23.53%) isolates. The young adult control group was also found to have a higher prevalence of *Escherichia coli* 3 (75%) when compared to that of *Klebsiella* species which had a lower prevalence of 1 (25%) (Table 2).

Table 1: Frequency of Enterobacteriaceae isolated in the test and control population.

Positivity/Negativity	Frequency of chronic nail biters	Percentage of chronic nail biters (%)	Frequency of non-nail biters	Percentage of non-nail biters (%)
Primary school pupils				
Positive	22	88	2	20
Negative	3	12	8	80
Total	25	100	10	100
Secondary school students				
Positive	16	64	3	30
Negative	9	36	7	40
Total	25	100	10	100
Young adults				
Positive	17	85	4	40
Negative	3	15	6	60
Total	20	100	10	100

Table 2: Showing the frequency of different isolated Enterobacteriaceae species in the test and control groups.

Isolated organism	Chronic nail biters	Enterobacteriaceae species (%) of chronic nail biters	Non-nail biters	Enterobacteriaceae species (%) of non nail biters
Primary school pupils				
<i>Escherichia coli</i>	8	36.36	Nil	-
<i>Klebsiella</i> species	14	63.63	2	100
Total	22	100	2	100
Secondary school students				
<i>Escherichia coli</i>	9	56.25	1	33.33
<i>Klebsiella</i> species	7	43.75	2	66.66
Total	22	100	3	100
Young adults				
<i>Escherichia coli</i>	13	76.47	3	75
<i>Klebsiella</i> species	4	23.53	1	25
Total	17	100	4	100

Enterobacteriaceae were isolated from 88.37% of the 43 male subjects and from 62.96% of the 27 female subjects in the study group. In the control group, Enterobacteriaceae were isolated from 40% of the 15 male subjects and from 20% of the 15 female subjects (Table 3).

From the results obtained using Pearson chi-square of goodness of fit, it was seen that in primary school children it was observed that there was significant prevalence among the two groups due to the p-value .005 being lower than the alpha value .05. There was also a significant difference in the test and control groups for the secondary school category at p-value of .003. In young adults the prevalence was significant when the test

group were compared with the control groups. This is so because the p-value .004 is lower than the alpha value .05. Hence I stand to reject the null hypothesis which

states that there is no statistical relationship between two variables occurring independently (Table 4)

Table 3: showing positive and negative growth of Enterobacteriaceae among males and females of the study and control groups.

Positivity/Negativity	Males (Study group) (%)	Females (Study group) (%)	Males (Control group) (%)	Females (Control group) (%)
Positive	38(88.37)	17(62.96)	6(40)	3(20)
Negative	5(11.63)	10(37.04)	9(60)	12(80)
Total	43(100)	27(100)	15(100)	15(100)

Table 4: showing the chi-square of the population (test group and control group).

Test group	Value	Df	p-value/significance
Primary school pupils	3.610 ^a	4	.005
Secondary school students	10.919 ^a	4	.003
Young adults	7.941 ^a	4	.004

p-value <0.05 was considered as a significant

DISCUSSIONS

Onychophagia is thought to occur mainly in childhood, but in some cases it may continue into adulthood. Data on the lifetime risk of onychophagia and the prevalence of current onychophagia in different populations are inconsistent. Most studies are limited to children or adolescents. Based on previous findings from such epidemiological studies, the prevalence of onychophagia during childhood and adolescence ranged from 20% to 33% however, some researchers estimated that nail biting may occur even more often, in up to 45% of adolescents evident in the study Onychophagia and Onychotillomania: Prevalence, Clinical Picture and Comorbidities by Pacan *et al.*,^[4] which confirmed that the highest prevalence of nail biting was found among children and adolescents while in this study, the significant prevalence in decreasing order was that of primary school with a p-value of .005, young adults with a p-value of .004 and secondary schools with a p-value of .05. Hence the comparison of primary school students, young adults and secondary school students may not be age dependent although only a few studies have assessed the frequency of nail-biting among adults.

In the study by Baydaş *et al.*,^[5] the test and control groups were not gender matched. There were 8 boys and 17 girls in the study group; whereas control group consisted of 16 boys and 18 girls. This is in contrast with this present study as 43 male subjects and 27 female subjects were included in the study group whereas control group has equal subjects.

There was a high percentage of Enterobacteriaceae isolated from the oral cavity of nail biters in primary and secondary schools and young adults of tertiary institution. The normal commensal or oral flora along with the other defense mechanisms, play an important role in protecting the oral cavity from infection by exogenous organisms.

In a study by Vyas *et al.*,^[2] on the Effect of chronic nail biting and non-nail biting habit on the oral carriage of Enterobacteriaceae, the presence of Enterobacteriaceae was significantly higher in nail biter subjects than non-nail biter subjects. This higher prevalence of Enterobacteriaceae among subjects with nail biting could be due to orofecal route of transmission of Enterobacteriaceae and poor general hygiene maintenance.

In this study the age range chosen for the subjects was from 9-25 which differs from the study by Vyas *et al.*,^[2] where 10-16 years subjects were selected. This present study had a prevalence of 88% Enterobacteriaceae in primary school, 64% Enterobacteriaceae in secondary school students and 75% from young adults. Hence the prevalence of Enterobacteriaceae in different age groups does not appear to co-relate with age although oral carriage rate may increase in old age, and in conditions leading to reduced salivary flow.

In a study by Adeyemi *et al.*,^[10] normal oral commensals in patients attending the Dental Clinic University College Hospital Ibadan were found in 10% of the buccal mucosa isolates, however, a high percentage of *Escherichia coli* and *Klebsiella* species which are predominantly colonic commensals were isolated. This is in line with this study in which a great percentage of these isolates were found.

A study by Baydaş *et al.*,^[5] reported that the test and control groups were not gender matched. There were 8 boys and 17 girls in the test group; whereas control group consisted of 16 boys and 18 girls. This differs in this current study as 43 male subjects and 27 female subjects were included in the test group whereas control group had 15 males and 15 females.

This could be as a result of the personal hygiene or etiquette exhibited more by females than males. However, the results are contrary to Ghanizadeh *et al.*,^[10]

who found that nail biting habit was more among girls although the difference between boys and girls was not significant.

CONCLUSION

This study has revealed that there was higher prevalence of Enterobacteriaceae in chronic nail biting subjects than non-nail biters. Chronic nail biting habit was found to be more in males than females. *Escherichia coli* was the most frequent bacterial isolate in young adults with chronic nail biting habits and *Klebsiella* was the most isolated Enterobacteriaceae specie from primary school pupils that practice onychophagia. Chronic nail biters may get contaminated by a variety of pathogenic microorganisms from the environment when they introduce these organisms into their mouth through biting of their nails.

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