

Determinants Of Adherence To Dental Treatment Of Socially Vulnerable Adolescents In Primary Health Care: A Cohort Study

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Abstract

Background: Different studies with adolescents address the difficulty they have to adhere to oral dental treatments. Therefore, better understanding the processes involved in adherence to treatment in this population is necessary. The aim of this study was to investigate the factors that influence adherence to dental treatment in socially underprivileged adolescents in primary care.

Methods: A longitudinal analytical study was conducted in Piracicaba, São Paulo, Brazil, between 2014 and 2015. The sample consisted of 1179 adolescents examined in family health units; of these, 474 were referred to treatment (40.2%) and 325 (68.6%) were reevaluated after 18 months. Adherence to dental treatment was the dependent variable. Independent variables were: individual (clinical, sociodemographic, access to the service, reporting pain, oral impacts on daily performance, family cohesion) and contextual (percentage of families in the neighborhood with income of 0.5 to 1 minimum wage).

Results: Non-adherence to treatment showed high rate in the studied sample (49.5%). Family income ($p=0.039$) and number of individuals in the family ($p=0.003$) were associated with non-adherence to dental treatment.

Conclusions: It is concluded that the adolescents' social vulnerability condition resulted in situations that are incompatible with adherence, which hinders dental treatment and health service planning.

Background

Adolescents constitute a population exposed to risk of developing major oral diseases, such as dental caries and periodontal disease. However, a similar aspect in studies with adolescents refers to their difficulty in adhering to health treatments[1]. Regardless of the disease, adolescents have greater difficulty in adhering to treatment than younger individuals[2]. Therefore, better understanding the prevalent processes involved in this population' adherence to disease treatment is necessary.

In recent decades, the epidemiological profile of dental caries in developed and developing countries has changed[3]. In Brazil, the same trend was found with a significant 35% reduction in decayed teeth in children and adolescents, between 2003 and 2010[4]. Despite the reduced prevalence of dental caries in Brazil, the polarization of caries disease is observed[5], with higher prevalence of the disease in underprivileged socioeconomic groups[6].

In addition to dental caries, periodontal disease is another oral disease that is concerning at this stage of life. The World Health Organization (WHO) recently reported that most children and adolescents show signs of gingivitis[3], whose prevalence is up to 80% in adolescents[8]. According to the latest Brazilian nationwide oral health survey, more than half of the adolescents aged 15 to 19 years show signs of the disease, such as bleeding (9.7%), calculus (28.6%) and periodontal pockets (10.8%)[9].

Multiple factors involved in the onset and progression of oral diseases can be cited, such as social, cultural, behavioral and economic determinants. Therefore, socioeconomic inequalities, such as differences in income, lifestyle, and access to health, can be considered aspects related to the etiology[10].

It is also emphasized that economic disadvantage entails social and cultural significances, which lead the underprivileged to be discriminated against, stigmatized, excluded, and, consequently, more susceptible to experiencing situations of vulnerability. Low income not only leads to deprivation of material goods, but also compromises autonomy in life decisions and self-care in health[11], including oral health care[12].

Thus, it is important that the health system makes access to treatment of oral diseases that affect the adolescents' health available, especially among those that are socially vulnerable[13]. In Brazil, the Unified Health System, by means of Primary Health Care, abides by its principle of tackling inequalities in service provision, providing health care service, including dental care, in more deprived localities[14].

However, only providing access to dental care does not guarantee the individuals' adherence to treatment. The adolescents' relations with their family and social environment they live in and their living conditions can facilitate or hinder adherence to treatment[15].

The literature shows a great number of studies about the different concepts regarding "adherence". This can be defined as an approach to the maintenance or improvement of health in order to reduce the signs and symptoms of a disease[16], but also by the degree of compliance with therapeutic measures, whether or not with use of medication[17]. It is a complex behavioral process, heavily influenced by the environment, by health care professionals and medical care. When individuals fully follow the treatment they are classified as "adherent"; when they quit the treatment they are classified as "quitter" or "non-adherent"; and finally there are the "persistent," within the "non-adherent" group, which are those individuals that attend the appointments, but do not follow the treatment[18].

There is a common misconception in thinking that factors related to patient behavior would be solely responsible for affecting their ability to adhere to treatment. However, the WHO, through the Adherence Project, believes that adherence can interact with several dimensions related to social and economic factors, the team/health care system, disease characteristics, disease therapy treatments and patient-associated factors[18]. Therefore, considering such factors, professionals have the opportunity to understand the expectations and characteristics of individuals who do not follow the recommended treatment, which enables more individualized interventions to improve adherence and hence provide a service with improved quality.

In this context, longitudinal studies with adolescents contribute to the determination of individual and contextual determinants associated with adherence to dental treatment and the tracing of variables that hinder the access of socially vulnerable adolescents.

Methods

This is a longitudinal analytical study conducted in the city of Piracicaba, São Paulo, Brazil, between 2014 and 2015. The study was approved by the Research Ethics Committee, protocol 027/2011.

Initial Phase

This study was directed to adolescents aged 15 to 19 years living in the area covered by 34 Family Health Units (FHU) in the city of Piracicaba. Among them, there are 12 units with oral health teams (dentist and dental assistant). These adolescents were enrolled in state schools in their territorial reference.

Family health teams provide primary care to about 1,000 families in the areas with greater social exclusion index of the municipality (≤ -0.75). The value of this index is evaluated by the Institute for Research and Planning of Piracicaba (IPPLAP, in Portuguese) and ranges from -1 (worst condition) to 1 (best condition)[19]. On average, 320 adolescents aged 15 to 19 years were enrolled in each of the 34 units, totaling approximately 11,000 individuals. Adolescents who participated in this study lived in areas with greater social exclusion, that is, they were in situation of social vulnerability. Before the search, the Free and Clarified Consent Form was delivered to the person responsible for

the adolescent in the home visits of Community Health Agents. For those guardians who authorized the adolescent to participate in the research, the agents scheduled the day and time for the participants to attend the units.

The original probabilistic sample of this study was calculated based on previously published studies[17]. In that occasion, 1,179 adolescents were examined (evaluation of caries and periodontal disease) between the second half of 2013 and the first half of 2014. The sample size was calculated based on caries experience in the Brazilian Southeast region, using survey data from the previous Nationwide Epidemiological Survey[9].

This phase included the adolescents covered by the 34 FHUs in the municipality. It is important to emphasize that the FHUs are distributed in the underprivileged areas of the municipality. A sampling error of 5%, DMFT = 5.16 with SD = 4.54, sampling loss of 20% and a 95% confidence level were considered, obtaining a sample of 1,428 randomly selected individuals. Of this total, 249 did not show up on examination day. Thus, 1,179 adolescents were examined. The sample exclusion criteria were individuals with systemic diseases, communication difficulties, or neuromotor problems, severe hypoplasia and orthodontic brace. Individuals who did not agree to participate in the study and those absent on the examination day were also excluded from the sample. Adolescents served in the health care unit were considered as inclusion criteria. Figure 1 explains the sequence of the study development stages.

-----Insert Figure 1-----

Final Phase (study of adherence)

About 18 months after the completion of the initial examination, the researchers conducted an active search in order to locate the adolescents who were referred to treatment in the initial phase.

Of the total 1,179 adolescents examined in the initial phase, 474 (40.2%) of them needed dental treatment and 705 received oral health promotion and prevention guidelines. Those who needed treatment were asked to schedule an appointment at the family health units, which were already prepared to receive them, for the treatment. In the units with no dentists, a referral form was given to the adolescent, who was told to go to the reference unit for treatment. The criterion for scheduling or referral was the presence of caries and/or periodontal disease.

In this study, the term "adherence" was understood as the ability to seek a health service and follow the recommended treatment. The clinical examination data were collected in the two phases of the study (initial and final) in order to determine who adhered to the dental treatment. Clinical examination in the final phase was performed to confirm whether the tooth that had previously been diagnosed with caries and/or periodontal disease had been treated. Those who did not seek care or even those who sought care but did not complete the treatment were considered non-adherent patients.

Of the 474 participants surveyed, 325 (68.6%) were reexamined, of which 164 (50.5%) adhered to dental treatment (adherence group) and 161 (49.5%) did not adhere (non-adherence group). A total of 149 adolescents were not reexamined due to change in address and telephone number (n=131), transfer to other municipalities (n=9) and refusal to participate in the study (n=9). As these adolescents were not found in the final phase of the study and did not schedule appointment at the FHU, it was not possible to know whether they underwent the treatment or not in another public service or in the private sector, so they were not included in the analysis. The final sample (325 adolescents) provided a test power of 0.80 with a 95% confidence level in the analyses performed considering adhesion of 50.0%.

Clinical Examination

The examinations were performed in the FHU, by two examiners (previously calibrated and helped by two note-takers), in an outdoor setting, under artificial light using a flashlight and with brushing previously performed under the guidance of a Dental Assistant. For each examination, a ball point probe and plane oral mirror were used. Data were collected with reference to the clinical characteristics: caries by the DMFT index (total decayed, missing and filled teeth) and periodontal disease (Community Periodontal Index-CIP), in accordance with the World Health Organization codes and criteria[20].

Pilot Study

The pilot study was conducted with twenty adolescents who were not randomized to be studied. After completing the data collection, twenty reviews were performed and, for each ten individuals examined, the last one was reexamined.

Training and Calibration

The process of calibrating the two examiners for the clinical conditions was conducted by a Gold Standard examiner. The final calibration exercise consisted of 2 periods with mean inter-examiner Kappa values of 0.95. In order to verify maintenance of the diagnostic criteria and intra-examiner error, 10% of the sample were re-examined, showing a mean Kappa value of 0.96.

Study Variables

At Level 1, we studied individual clinical; sociodemographic (sex, number of people in the family), access to the service (reason to seek the dentist), reported pain (pain in the last 6 months), social impact of dental disease (OIDP) and family cohesion. At Level 2, we analyzed the contextual variable: percentage of families in the neighborhood with income from 0.5 to 1 minimum wage. The minimum wage in Brazil at the time of data collection was US\$ 1,796.70.

In clinical evaluation, we considered the presence of caries, pain, abscess and/or periodontal disease, according to the WHO criteria [20].

A semi-structured questionnaire based on the Goes model [21] was applied to the set of individual variables (sex, income from 0.5 to 1 minimum wage, number of people in the family). In order to investigate the reason that led the adolescent to seek the dentist, the following question was asked: "What is the most frequent reason for you to seek the dentist?" To this end, the respondent could choose from the following answers: "for frequent checking," "only when I have a problem," and "I do not know/I do not remember."

The instruments used in this study were OIDP – Oral Impacts on Daily Performances and FACES III (Family Adaptability and Cohesion Scale). The instruments were self-administered under supervision in case of doubt. OIDP is a socio-dental indicator measuring the impact of oral health conditions on daily activities [22] and was obtained by adding the scores of eight frequency items: "Over the last 6 months your mouth and/or your teeth caused you any

difficulty to 1) eat, 2) speak and pronounce clearly, 3) clean the teeth, 4) sleep and relax, 5) smile without embarrassment, 6) maintain emotional state, 7) enjoy the contact with others, and 8) perform schoolwork. It has a logical approach to quantify the impact by evaluating the frequency and severity distributed in a five-point scale. The scale used ranges from (0) "never affected" to (5) "every day or almost every day". The severity score measures show the relative importance of the informant's perception of impact on daily performance and ranges from (0) "no severity" to (5) "extremely severe." The FACES III questionnaire (Family Adaptability and Cohesion Scale), validated in Brazil [23], was applied to evaluate the perceived family cohesion and adaptability. It consists of 20 questions; the odd numbered questions assess cohesion and the even numbered questions assess adaptability. Each question is assigned a value from 1 to 5; the value 1 corresponding to hardly ever and the value 5 to quite often. The sum of values is performed and the final score can range from 10 to 50 for each domain.

Data Analysis

Individual categorical variables were evaluated: adherence to dental treatment (yes or no), sex (male/female), reason to seek dental treatment (pain, extraction, treatment, checking, cleaning/fluoride and others), pain in the last 6 months (yes, no, I do not know and I do not remember). And also non-categorical variables classified into individual variables (number of people in the family, OIDP, and family cohesion) and contextual variable (percentage of neighborhood families with income of 0.5 to 1 minimum wage).

Adherence to dental treatment was considered as response variable. Using the descriptive analysis data, multilevel logistic regression models were estimated by the GENMOD procedure, using the statistical program SAS. In the analysis, the individuals' variables were considered as level 1, neighborhood as level 2, and the setting model was evaluated by the QIC (Quasi Likelihood Under Independence Model Criterion).

Initially, a model with only the intercept was estimated (model 1). Next, variables of individuals were tested (model 2). In model 3, the significant variable in model 2 and including contextual variable remained ($p < 0.05$).

Results

The average age of the adolescents reexamined was 17 years (standard deviation = 1.3). Among them, 188 (57.8%) were female and 137 (42.2%) were male. Table 1 presents the descriptive analysis of individual variables studied in the initial phase. Regarding the reason to seek dental treatment, 34.2% answered that sought the dentist to treat the teeth, and 36.6% had tooth pain in the last 6 months.

Table 1
Distribution and frequencies of the variables evaluated in the sample of adolescents that needed dental treatment (Initial phase) 2013–2014.

Variables	n	%
Gender		
Female	188	57,8
Male	137	42,2
Reason to go to the dentist		
Pain	55	16,9
Teeth extraction	12	3,7
Dental treatment	111	34,2
For checking	54	16,6
Cleaning, fluoride	41	12,6
Other	26	8,0
Did not answer	26	8,0
Dental pain in the last 6 months		
Yes	119	36,6
No	182	56,0
Do not know / Do not remember	20	6,2
Did not answer	4	1,2

Table 2 shows that the number of people in the family ranged from 1 to 6, with a median 4, and the percentage of families with income from 0.5 to 1 minimum wage ranged from 4.1–16.9%, with median of 10.4%.

Table 2

Median, minimum and maximum of individual and contextual variables evaluated in the sample (initial phase), 2013–2014.

Variables	Median	Minimum-Maximum
OIDP	0	0-135
Family cohesion	32	13–46
Number of people in the family	4	1–6
% income 0.5 to 1*	10.4	4.1–16.9
OIDP: Oral Impact on Daily Performance; * % of families with income from 0.5 to 1 minimum wage (the minimum wage at the time of data collection was US\$ 1.796,70)		

Table 3 shows the multilevel model for the response variable adherence to dental treatment (yes and no). Model 2 showed an association between non-adherence people and crowding situation ($p = 0.003$). Higher percentage of the

non-adherence group was also observed in adolescents from neighborhoods of families with lower incomes ($p = 0.039$), according to the model.

Table 3
Multilevel model for adherence to dental treatment, 2014–2015.

Variables	Model 1			Model 2			Model 3		
	Estimate	SE	p-value	Estimate	SE	p-value	Estimate	SE	p-value
Intercept	0.0062	0.1296	0.9621	1.0025	0.3361	0.0029	1.9146	0.5766	0.0009
Individual level									
Number of people in the family				-0.2538	0.0700	0.0003	-0.2432	0.0678	0.0003
Contextual level									
% income 0.5 to 1*							-0.0846	0.0411	0.0396
QIC	453.2737			440.0044			437.7239		
* % of families with income from 0.5 to 1 minimum wage (the minimum wage at the time of data collection was US\$ 1.796,70); SE = StandardError									

Discussion

The results showed that socioeconomic conditions (family income and number of people in the family) were associated with non-adherence to dental treatment among socially vulnerable adolescents. This finding is important, since, in this study, access to dental treatment was guaranteed to patients; however, the behavior of adhering to the professionals' guidelines was not adopted, and the adolescents did not return for consultation.

Thus, it is observed that, in addition to socioeconomic conditions contributing to the onset of oral problems [12], this is a factor that operates in a complex way on health. Economic factors lead to a lower perception of oral health needs [12] and to reduced opportunities for study, leisure, and work, which can impact subjects in decision-making aimed at protecting their own health [11].

Therefore, special attention should be directed to more socially vulnerable adolescents, considered "underprivileged," because social, political and economic inequality has a direct influence on family dynamics and, therefore, increase the personal and social risk situation experienced by these individuals. Additionally, adolescents, in their capacity as "developing individuals," have an intrinsic condition of vulnerability, lacking physical, mental and moral care, that is, a comprehensive understanding of their needs [24].

In this study, adolescents from neighborhoods with the worst social exclusion rates in the city of Piracicaba (State of São Paulo), that is, considered underprivileged, were reexamined. Among the subjects evaluated, 50.5% adhered to dental treatment and 49.5% did not. Non-adherence has important clinical and social consequences. The most direct consequence is dental treatment failure, which may result in oral disease complications and, consequently, worse prognosis and delay in the control and cure of these diseases. Moreover, non-treatment of the disease may lead

to deterioration of oral health and, consequently, increase the demand for specialized services and budget expenditures of the public sector.

In the results of this study, individuals who did not adhere to dental treatment were those from the lower-income neighborhood families (0.5 to 1 minimum wage), consistently with Carvalho [25], who associated non-adherence to antiretroviral treatment to the income of the surveyed families. Another study evaluated the level of adherence to treatment with antimicrobials and found that subjects with monthly family income above six minimum wages showed 8.3 times higher adherence than those with an income of five or less minimum wages[26]. Thus, income can be related to adherence mainly in extreme cases of poverty, since this condition leads to difficulty in adhering to treatment [27].

Family income directly influences the individuals' lifestyle, since greater purchasing power can help in maintaining health and in preventing and treating diseases. In contrast, low income negatively impacts the acquisition of healthy behaviors by the population. Housing conditions are also considered as risk factors, and the residence should be evaluated when establishing a social exclusion situation [27].

The variables related to family status and socioeconomic level are very important in determining low adherence to treatment. Therefore, the results of this study showed that these variables have had greater impact on adherence than those arising from the disease characteristics, the treatment, or the adolescents.

In this study, a larger family was associated with lower adherence to treatment. The number of people in the family is used in some researches to estimate family crowding, which also considers the number of rooms available in the residence. In these researches, family crowding was considered as a dynamic factor that impacts the individuals' health [28,29], including the adolescents' oral health condition, as it represents a proxy variable for the social context in which they live [30]. However, there are no studies relating the number of people in the family or family crowding with adherence to dental treatment.

With this variety of factors, the health team must know the determinants that may interfere with adherence; it is imperative to recognize the specifics of their particular population. Understanding the sociocultural factors that impact adherence may help in defining what to recommend to patients, improve the communication between patient and professional, and increase adherence to the proposed treatment [31].

It is worth noting that the inclusion of socially vulnerable individuals in dental care does not depend exclusively on the organization of services. Even in public dental services, there must be planning coordinated with social care [13]. Social care can strengthen the intersectorality of actions, approaching families and their adolescents more effectively. This sector can include families in income transfer programs, helping in family planning, reinforcing the importance of children and adolescents attending schools, including guardians in programs that promote access to work, thus contributing to positively impact the social determinants that affect access to health. Specifically, social care can develop strategies that minimize the effects of vulnerabilities, which must be known and practiced by health teams.

The results of this study point to a greater possibility of non-adherence by adolescents from large families. In addition, it should also be considered that the family is an important medium for dissemination of ideas and behaviors. Therefore, focusing on large and low-income families is, mainly, a health education action in conjunction with social care, with far-reaching potential.

It is important to note that the data was analyzed using multilevel analysis model, whose relevance has been pointed out by several researchers[10]. This type of model is known for providing a more accurate assessment of the relations between the environment and the individuals. Probably, to date, this study is one of the first to use this technique to study factors that influence adherence to dental treatment of underprivileged adolescents.

However, we can mention some limitations. The main limitation, evidently, is related to the non-response rate, since we had difficulty in locating an important portion of the sample of adolescents. We clarify that the dental clinical condition was investigated, as it is associated with the need for treatment [32]. The need for treatment is one of the predisposing factors for access to dental services [33], and consequently indicates adherence to the indicated dental treatment. Perhaps, a limitation in the use of these clinical variables lies in the fact that other oral conditions prevalent among adolescents, such as malocclusion [34], could have been explored. However, malocclusion was not investigated in this study because the necessary dental treatment is not provided in primary health care. We also suggest qualitative studies exploring the adolescents' perception of the need for treatment and its relation with adherence to dental treatment, providing further understanding of the factors impacting the adolescents' adherence to dental treatment.

Conclusions

The non-adherence to treatment rate was high in the studied sample, and the variables – family income of the neighborhood and number of people in the family – were statistically associated with non-adherence to dental treatment in primary health care.

List Of Abbreviations

World Health Organization (WHO)

Family Health Units (FHU)

Institute for Research and Planning of Piracicaba (IPPLAP)

Decayed, Missing and Filled Teeth (DMFT)

Dental Social Impact (OIDP)

Family Adaptability and Cohesion Scale – (FACES III)

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Research Ethics Committee of the Piracicaba Dental School, State University of Campinas (UNICAMP) (protocol number #027/2011) in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Written consent was obtained from the guardians before starting the study. Written consent was also obtained from adolescents of legal age.

CONSENT TO PUBLISH

Not applicable

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors declare no conflict of interest.

FUNDING

No funding was obtained for this study.

LIST OF ABBREVIATIONS

World Health Organization (WHO)

Family Health Unit (FHU)

Institute for Research and Planning of Piracicaba (IPPLAP)

Decayed, Missing and Filled Teeth (DMFT)

Oral Impact on Daily Performance (OIDP)

Family Adaptability and Cohesion Evaluation Scale – (FACES III)

AUTHORS' CONTRIBUTIONS

JVB, FLV, KLC, and LMG participated in the conception, design, and data collection. AKK and IPC participated in the article writing. GMBA, ACP participated in the critical review.

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Figures

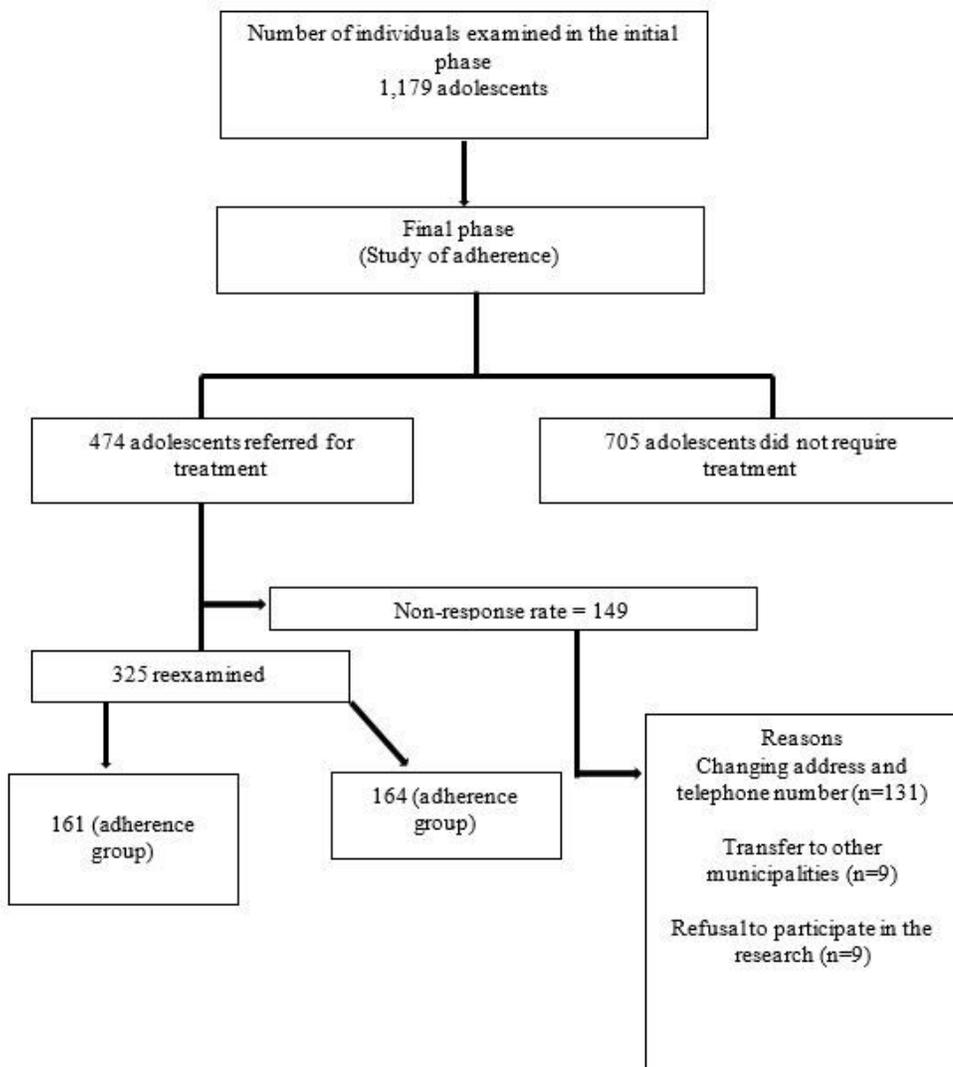


Figure 1

Representative flowchart of the study phase13.