

Research Article

Dental Prediction Factors of Schizophrenia: A Pilot Case-Control Study in Morocco

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Abstract

Introduction: Schizophrenia is a severe mental illness associated with significant morbidity and mortality. This study suggests that some dental or skeletal characteristics may be potentially associated with schizophrenia. **Method:** A case control study was conducted from 2020 to 2022 among 30 schizophrenia patients and 30 control patients. Data was collected through a clinical exam and radiographs for each patient. Different variables were assessed including teeth dimensions, maxillary and mandibular width, occlusal characteristics and cephalometric values: SNB, IMPA, and FMA. Proportions and mean with standard deviations were used as descriptive measures. Only variables with p-values < 0,05 were considered as statistically significant and associated with schizophrenia. **Results:** The mean ages of schizophrenia patients and controls were 34.0 +/- 9,12 and 17,3 +/- 2.0 years respectively. The results reported a statistically significant difference, between the two groups, at maxillar and mandibular arch depth [p < 0,001 and p=0,036 respectively], SNB [p = 0,013], overbite [p < 0,001], overjet [p = 0,002] and spee curve [p = 0,006]. **Conclusion:** According to these study findings, some dental, skeletal and occlusal characteristics may be related to schizophrenia. However, further studies with larger sample sized and long-term follow-up may be needed to confirm these findings.

Keywords

Dental, Prediction Factors, Schizophrenia

1. Introduction

Schizophrenia is one of the most common debilitating psychiatric disorders and its prevalence is 1% among world-wide population [1]. Therefore, it has a severe medical and

economic burden.

Schizophrenia manifests with marked heterogeneity in both clinical presentation and underlying biology.

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The onset of the illness begins with a prodromal phase in the early adolescent years, whereas first psychotic symptoms appear at late adolescence or early adulthood [2, 3]. Therefore, first psychiatric consultation is usually delayed at this stage. [2].

Untreated schizophrenia leads to cognitive and affective impairment, quick relapse, accelerate cognitive decline, exacerbate psychotic symptoms, worsen social functioning, and could even cause resistance to antipsychotics.

On the other hand, due to lack of oral hygiene related to behavior and cognitive disorders, we submitted that predisposed schizophrenia patients may benefit from early dental referral. This suggests that dentists may have an early contact with these patients, and diagnoses early symptoms such as behavior, cognitive or even dental symptoms. Hence, dentists may collaborate to an early orientation to psychiatric consultation.

Recently, the interest in researching the association between schizophrenia and several physical or biological factors has increased rapidly. However, no study was realized to determine if there were any association between dental and maxillofacial signs with schizophrenia or its severity.

Therefore, we conducted a pilot case-control study to examine dental characteristics that may be associated with an increased risk of schizophrenia or its progression, specifically in a Moroccan population. We hypothesized that these dental and maxillofacial signs in the schizophrenia group might differ from the control cases.

Hence, the main clinical objective is to assess if it is possible to early diagnose schizophrenia through a bucco-dental consultation.

2. Materials and Methods

2.1. Study Design and Participants

This case-control study was conducted from 2020 to 2022. 60 participants were included, 30 patients with a confirmed diagnosis of schizophrenia, and 30 healthy control cases. Eligible schizophrenia patients were recruited from the outpatients in Ar-razi university psychiatric hospital in Sale in Morocco.

2.2. Procedures and Clinical Investigation

Screening consisted of written informed consent filled by the patient and its legal tutor.

An experienced clinical and professor of psychiatry (Hind Nafaa. MD) assessed screening of eligible schizophrenia patients. Patients took the MINI test and the diagnosis of schizophrenia was made according to the diagnostic criteria of DSM 5.

Healthy controls were recruited from Center of dental consultations and treatments of Ibn-Sina Hospital in Rabat. They were included if they had no history of a medical or Axis I psychiatric diagnosis.

2.3. Inclusion Criteria

- 1) All participants were required to be at least 18 years of age and no older than 60 years old
- 2) Patients with schizophrenia diagnosis
- 3) Written consent

2.4. Exclusion Criteria

- 1) Children and teenagers under 18 years old
- 2) Elder people (older than 60 years old)
- 3) People with neurocognitive impairment
- 4) People with intellectual deficiency

2.5. Data Collection

A first orthodontist resident carried out dental consultation and impression for each case. Through bucco-dental consultation, several clinical informations were reported including: health status, history of dental treatments, oral hygiene quality, existence of any dysfunctions or parafunctions, exo-oral characteristics as like as facial symmetry and divergence, and type of facial profile and smile, also endo-oral characteristics essentially occlusal parameters.

A second orthodontist resident realized, on the one hand, measurements of teeth and arch dimensions. On the other hand, the resident carried out cephalometric analysis using each case cephalogram.

2.6. Clinical Outcomes

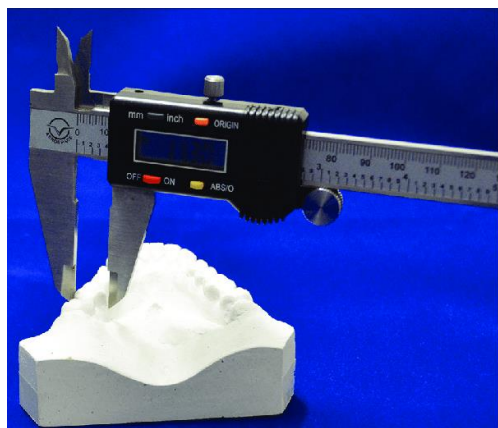
2.6.1. Teeth Dimensions

Measurements of each teeth were realized in the three dimensions: bucco-lingual, vertical and mesio-distal using an digital vernier caliper.

2.6.2. Maxillary and Mandibular Arch Dimensions

For each dental model, different measurements were carried for both maxillary and mandibular arch, using an electronic caliper:

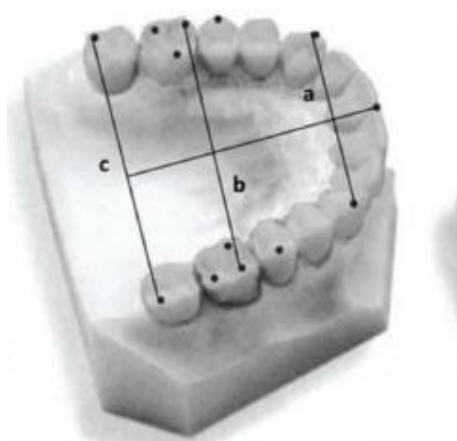
- 1) *Anterior arch width*: which represents the distance between the cusps of the two canines
- 2) *Posterior arch width*, which corresponds to the distance between the cusps of the two first permanent molars
- 3) *Arch depth*, which corresponds to maximum depth between the occlusal plane and the palate or the mouth floor respectively in the mandibula or the maxilla



a. Measurement of buccolingual width



b. Measurement of mesio-distal width



c. Measurement of anterior arch width (a) and posterior arch width (b)

Figure 1. Measurement of teeth dimensions using a digital Vernier caliper.

2.6.3. Skeletal and Cephalometric Characteristics

A tweed cephalometric analysis were carried out for both schizophrenia patients and healthy cases [figure 2]. Therefore, several skeletal and dento-alveolar variables were collected essentially: ANB, FMA, and IMPA. Through these variables, skeletal diagnosis were established for facial morphology

through FMA values and skeletal class using ANB values [4].

Vertical skeletal pattern:

The vertical skeletal pattern corresponds to facial morphology in the vertical dimension. In fact, a facial biotype classification exists, which leads to establish vertical facial diagnoses [4].

Therefore, if FMA was less than 22° , the case was diagnosed as brachyfacial; which refers to a short and wide face

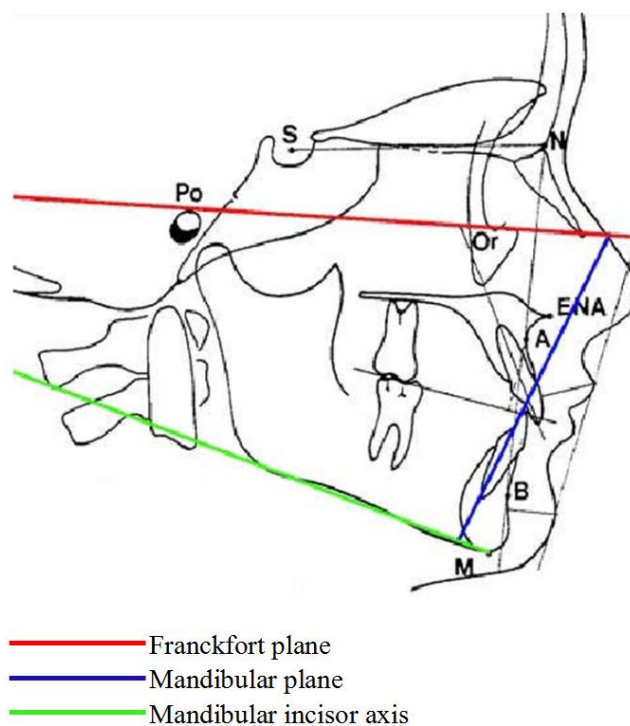
If FMA varied between 22° and 25° , the case was diagnoses as normofacial, an intermediate face type.

Else, the case was described as dolichofacial. This diagnosis refers to a long and narrow face type.

Skeletal class

Orthodontist resident defined the jaw relationship between maxilla and mandibula using skeletal class classification, which is characterized with three types of topographies.

A Class I jaw relationship suggests a normal relationship between the two. In the class II relationship, the mandible acquires a more mesial position in relation to the maxilla and/or cranial base, whereas in a class III relationship, the mandibula takes a more mesial position [5].

**Figure 2.** Measurement of skeletal characteristics.

2.6.4. Occlusal Characteristics

Occlusion is the manner in which the lower and upper teeth intercusate between each other in all mandibular positions or movements [10]. It has been generally classified into three distinct types: ideal occlusion, normal occlusion or malocclusion. Ideal or normal occlusion are both functional and physiological occlusions that are characterized with a

smoothly function of the different components of the masticatory system and without any pain; whereas malocclusion constitutes a pathological occlusion [10].

In order to define if the patient present a physiological or pathological occlusion, various parameters are assessed through an endo-oral examination and a rigorous study of dental models. Therefore, main of these parameters were evaluated in this study in order to compare schizophrenia patients occlusion to healthy cases occlusion; namely overbite and overjet [figure 3] and depth of curve of spee [figure 4].

Overbite and overjet

Overbite corresponds to the vertical relation between the upper and the lower incisors, whereas overjet corresponds to the horizontal relation [figure 4]. Thus, overbite was measured as the vertical distance between the incisal edges of the lower and upper incisors, and overjet was measured as the horizontal distance between the labial surfaces of lower and upper incisors.

Curve of Spee

The depth of curve of Spee was measured as the perpendicular distance between the deepest cusp tip and a flat plane that was laid on top of the mandibular dental model, touching the incisal edges of the central incisors and the distal cusp tips of the posterior teeth in the lower arch. For a better precision, the measurement was made on the right and left side of the dental arch and the mean value of these two measurements in addition of 0,5 mm was used as the depth of curve of Spee. Indeed, this measurement was realized using Baldrige index [11]. [figure 4]

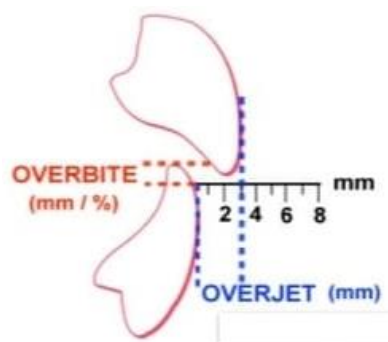


Figure 3. Measurement of the overjet and the overbite.

- 1-Overjet
- 2-Overbite

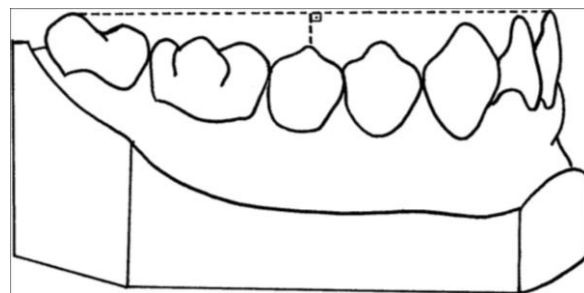


Figure 4. Measurement of the depth of the curve of spee.

2.7. Statistical Analysis

Comparison between the case and control groups among quantitative variables were assessed either by t-students test or Mann-whitney test;

Comparison between the two-group among qualitative variable were analyzed using Chi square test depending on type of the variable [quantitative or qualitative].

The case-control data were also analyzed using univariate and multivariate logistic regression. Data were analyzed using the JAMOV software version 2.3.24.

2.8. Ethics Committee

The ethics committee of the Faculty of Medicine and Pharmacy of Rabat was contacted and gave its agreement to carry out this study project.

3. Results

The sex ratio was equal in the two groups. However, the mean age was significantly older in the schizophrenia group [table 1].

The maxillary and mandibular arch depth was significantly greater in the schizophrenia group, as well as SNB, the angle that joins the middle of the sella turcica and the nasion point and the line passing through the nasion point and the most posterior of the mandibular symphysis. Moreover, occlusal characteristics including spee curve, overbite and overjet was significantly different between the two groups [table 1]. Regarding teeth dimensions, no statistically differences between the groups were found.

Table 1. Descriptive statistics for the difference in the clinical outcomes between the two groups (schizophrenia and case-control study).

	SCHIZOPHRENIA GROUP	CONTROL GROUP	P
Age (years)	34.0 +/- 9,1	17,3 +/- 2.0	< 0,001*
Gender			
Female	17 (56,8)	17 (56,8)	1,000

	SCHIZOPHRENIA GROUP	CONTROL GROUP	P
Dento-skeletal characteristics			
Maxillar arch depth	20,3+/- 4,3	16,5 +/- 3,6	< 0,001*
Mandibular arch depth	21,6 +/- 18,8	14,1+/- 2,5	0,036*
FMA	29,1+/- 5,0	28,2 +/- 5,3	0,52
ANB	4,62+/- 2,66	3,53+/-3,67	0,192
SNB	80,7+/-4,9	78,0+/-3,15	0,013*
Facial morphology			0,68
<i>Brachyfacial</i>	2 (6,7)	4 (13,3)	
<i>Normofacial</i>	10 (33,3)	9 (30,0)	
<i>Dolichofacial</i>	18 (60,0)	18 (60,0)	
Skeletal class			0,37
<i>Class I</i>	17 (56,7)	15 (50)	
<i>Class II</i>	12 (40)	11 (36,7)	
<i>Class III</i>	1 (3,3)	4 (13,3)	
Occlusal characteristics			
Spee curve	2,38+/-0,57	3,20+/-1,45	0,006*
Overbite	1,58+/- 1,07	3,25 +/- 1,61	<0,001*
Overjet	1,37+/- 1,07	3,05 +/- 1,81	0,002*

4. Discussion

According to neurodevelopmental model in schizophrenia, minor physical anomalies could be present since fetal stage [12]. Minor physical craniocerebral abnormalities (at the level of the ears, the palatal vault, the head circumference), temporomandibular, dental and palatal abnormalities, disturbances of dermatoglyphs or even subtle neurological signs have frequently been found in schizophrenic patients [7, 13]. Many studies about palatal dysmorphogenesis and craniofacial abnormalities were conducted, but none explored dental diameters, shapes and sizes in schizophrenia patients [4, 13]. Our study is the first in Morocco so far that focused on dental anomalies and found that there is a statistically significant difference between schizophrenia patients and controls.

These differences may be due to the illness it-self or to the medications that have been prescribed.

In fact, untreated schizophrenia may lead to a spontaneous emergence of movement disorders including tongue protrusion, chewing movements and choreoathetoid movements of the extremities [8-14]. In particular, schizophrenia patients may have a tendency of projecting the lower jaw forward, which may explain a greater SNB and a

lower overjet in the schizophrenia group. All these movement disorders constitute a motor manifestation of the underlying cerebral pathology associated with severe schizophrenic illness [14].

Otherwise, the use of conventional or other antipsychotic medications can lead to several orofacial manifestation including acute dystonias, pseudoparkinsonism and tardive dyskinesia [9, 15].

Main of these manifestations are due to a dysfunction or a dyskinesia of the tongue that may cause changes in bite and occlusal rapports of the mandibular and maxillary jaws. This may explain the statistically differences in overjet and overbite. Indeed, an decreased overbite value is reported in the schizophrenia group which a protrusion or interposition between the teeth while swallowing or pronouncing [9-14]. Tongue dysfunction may also explain the greater maxillary depth of the maxilla in the schizophrenia group. Indeed, the growth and the final shape of the maxilla depends on several factors mainly a normal tongue function. Therefore, in the context of a tongue dysfunction, the maxilla manifests a greater depth. Coherently with the results of the previous study, a heightened palate is one of the noteworthy finding of our study. [4-6]

Moreover, differences in overbite can may be explained by various acute dystonia, essentially forced opening of the mandible [9].

Therefore, attempting to differentiate individuals with schizophrenia from those without schizophrenia, this study suggests that various variables related to occlusion, craniofacial characteristics and tongue dysfunction might aid correctly predicted patients with schizophrenia.

As health care professionals, dentists must be able to recognize patients with initial signs and symptoms of schizophrenia and provide them appropriate referral sources for definitive diagnosis and treatment [9].

5. Conclusion

Exploring dental anomalies in schizophrenia is an interesting way to predict schizophrenia at an early prodromal stage at a subclinical stage, and therefore shorten the time of untreated psychosis and thus improve the prognosis.

Schizophrenia can be associated with minor physical anomalies, especially in the craniofacial area. These development abnormalities may constitute significant predictors of schizophrenia.

Coherently to previous studies, this study confirm that minor craniofacial anomalies may be markers of risk of schizophrenia, and up to now, it's the first study in which a quantitative assessment of dental and occlusal characteristics was conducted in order to found dental factors associated with schizophrenia. Noteworthy results were found and support that dentists and especially orthodontists, in correlation with cognitive and behavior factors, can detect dental factors that may be predictors of schizophrenia.

Abbreviations

SNB	Corresponds to a Cephalometric Value That Reports the Relationship Mandibular Jaw and the Base of the Skull in the Anteroposterior Dimension
FMA	Corresponds to a Cephalometric Value That Reports the Facial Morphology
IMPA	Corresponds to a Cephalometric Value That Describes the Position of the Lower Incisor in the Mandibular Jaw

Author Contributions

Hind Nafiaa: Conceptualization, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing

Yousra Boulatar: Formal Analysis, Methodology

Intissar El Idrissi: Investigation, Methodology

Meryem Zabarra: Conceptualization, Writing – review & editing

Fatima Zaoui: Project administration, Resources

Loubna Bahije: Resources, Supervision, Validation

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Conflicts of Interest

The authors declare no conflicts of interest.

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