Factors Associated with Deterioration in Quality of Life of Subjects after Maxillofacial Fractures - A Prospective Study

Adekunle Moses Adetayo, Mayowa Solomon Somoye[1], Oluwatoyin Adetutu Fasesan[2], Ayodeji Titus Oyedele, Modupe Olusola Adetayo[3]

Department of Surgery, [2]Department of Internal Medicine, Psychiatry Unit, Benjamin Carson (Snr) School of Medicine, Babcock University, [3]Department of Biochemistry, Babcock University, Ilisan-Remo, Ogun State, [1]Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital, Lagos State, Nigeria

Abstract

Introduction: Maxillofacial fractures (MFs) are quite common and are managed by oral and maxillofacial surgeons. Despite these interventions, a pre-traumatic facial profile is often not achieved with consequent social and psychologic consequences. **Materials and Methods:** Patients with fractures to the middle and lower third of the face that presented within 48 hours and healthy controls (subjects without facial fracture) that were sex- and age-matched with the fracture patients were recruited into the study. World Health Organization Quality of Life - Brief Version (WHOQOL-BREF) questionnaire was used to compare the Quality of Life (QoL) values according to age, gender, educational status, employment status, marital status, site of trauma and type of fracture. **Results:** Only the age of subjects was associated with deterioration in QoL after MF while other variables were not. **Discussion:** Increasing age of the patients was associated with higher QoL possibly because those with age <30 years are single and unemployed and may have fear and anxiety that the fracture could affect their chances of getting married or being employed, causing reduced QoL. Psychosocial rehabilitation is very important in patients with MF, especially for the young age group.

Keywords: Deterioration, factors, quality of life

INTRODUCTION

Maxillofacial fractures (MFs) are quite common, with an appreciable proportion resulting from road traffic accidents (RTA) in developing countries.[1] These fractures are treated by oral and maxillofacial surgeons either through closed reduction, open reduction or conservatively.[2] Despite these interventions, a pre-traumatic facial profile is not often achieved, and the resultant facial disfigurement can have negative social and psychological consequences.[3] Notably, facial trauma is associated with psychiatric disorders such as anxiety and depression.[4,5]

Quality of life (QoL) is increasingly being recognised as an important outcome of surgically treatable conditions,[6] and it is now established as an important outcome to evaluate the impact of diseases and to assess treatment efficacy.[7] People living with facial disfigurement due to facial trauma are at increased risk of experiencing a significantly reduced QoL.[8] Furthermore, research has shown that a significant relationship exists between facial trauma and post-trauma unemployment, marital problems, binge drinking and involvement with the criminal justice system.[6,8]

Several effective tools to measure the well-being and QoL of patients have been developed.[9] The Sickness Impact Profile developed by Klonoff *et al.*,[10] the General Oral Health Assessment Index introduced by Atchison and Dolan[11] and the Life Satisfaction Index[12] have been used successfully to measure well-being and QoL. WHOQOL (WHOQOL-100), and especially World Health Organization Quality of Life - Brief Version (WHOQOL-BREF), the abridged version, has been widely employed in many studies,[6-8] including a previous study published by the authors.[13]

The WHOQOL-BREF has two components; one each from the overall QoL and the general health sections, and also a

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component from each of the remaining 24 facets that are seen in the WHOQOL-100, leading to a total of 26 components which are rated on a five-point scale.[2] On WHOQOL-BREF, domains 1 and 3 and 2 and 6 of the WHOQOL-100 were merged to make a total of four domains: physical health, psychological health, social relationships and environment [Appendix I]. WHOQOL-BREF is widely used because its brevity has reduced the cumbersomeness reported by patients and has facilitated its use with other measures. WHOQOL is a generic tool designed for use in various psychological and physical disorders[2] [Appendices I and II].

QoL studies in patients with medical ailments revealed that socioeconomic status, age, body mass index and level of education significantly predict the deterioration of QoL.[14,15] Although several studies[4,7] have established a significant drop in the QoL of persons with MF, the contributing factors have been poorly investigated. In maxillofacial trauma, being female, being older than 40 and existing dental or oral health problems are patient-related factors that were found to have significantly contributed to QoL decline.[16-18] Meanwhile, some studies could not find a relationship between age, gender and prior oral problems and deterioration in QoL post-maxillofacial trauma.[19,20] Some researchers observed a decline in QoL as the number of fractures suffered by the patients increases,[21,22] while emphasising that it is the patients' perception of injury severity that is associated with QoL.[20]

Globally, studies that reported the predictive factors of QoL following a maxillofacial trauma are sparse,[20,22-24] and to the best of our knowledge, no African study has looked into this area. Therefore, this research investigated the factors that are predictive of patients having reduced QoL following maxillofacial trauma.

MATERIALS AND METHODS

This was a prospective comparative study of predictors of factors associated with QoL after an MF. A sample size formula adapted from the study of Ukpong *et al.*,[7] was used to compare the means of the MF patients and controls to give a sample size of 47, including an attrition rate of 10%. Consecutive MF patients who presented to the Department of Oral and Maxillofacial Surgery of the University Teaching Hospital between April and December 2015, were recruited into the study after obtaining informed consent. A comparative group of healthy controls (subjects without facial fracture) that were sex and age-matched to the trauma group were recruited from the family members of the patients. Ethical approval was obtained from the Health Research and Ethics Committees of the University, ADM/DCST/HREC/1425.

The aim was to determine the factors that are associated with the deterioration of QoL after MF.

The objectives are:
1. To determine the QoL of subjects after MF
2. To compare the changes in QoL of subjects after MF with those of healthy controls

3. To assess factors associated with deterioration in QoL of the subjects.

Inclusion criteria
- Subjects with fractures to the middle and lower third of the face that presented within 48 hours
- Subjects that were 18 years and above.

Exclusion criteria
- Subjects with fracture of the upper third
- Subjects with infections or polytraumatised patients.

Diagnosis of fracture was made with the use of three-dimensional craniofacial computerised tomogram. Data collected included age, gender, educational status, employment status and marital status. The clinical data collected were the site of trauma and type of fracture. Facial fractures were classified into the upper third, middle third and lower third. Fractures were further classified based on the specific bones affected.

We compared the QoL of the trauma patient and control group using the WHOQOL-BREF Questionnaire before treatment and three months post-operatively. QoL scores were computed according to age, gender, type of fractures and number of fractures.

QoL values were calculated by computing raw scores of simple algebraic sum of each item in each of the four domains, as shown below.

Physical domain = ((6–Q3) + (6–Q4) + Q10 + Q15 + Q16 + Q17 + Q18)

Psychological domain = (Q5 + Q6 + Q7 + Q11 + Q19+ (6–Q26))

Social relationships domain = (Q20 + Q21 + Q22)

Environment domain = (Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25)

To minimise confounders as much as possible, the following steps were taken;

Subjects with trauma to any other parts or infections were excluded. All the patients were made to fill out the questionnaire on their own without the probing eyes of the investigators.

Data analysis
The raw domain scores were converted to transformed scores on scale of 0–100 using the chart below [Appendix II]. If, for example, the raw score for physical domain (Domain 1) is 20, then the transformed score on 0–100 scale would be 44. Higher figures denote high QoL and vice versa. Data were entered and analysed using the Statistical Package for Social Sciences (SPSS, IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp). Percentages, mean and standard deviation of numerical variables were determined. Chi-square test, *t*-test and simple way analysis of variance were used in the analysis. Confidence interval was set at 95% for all statistical tests and statistical test was considered significant when $P \leq 0.05$.

RESULTS

The study included 50 patients with maxillofacial trauma that were age and gender-matched with 50 control subjects. The patients comprised 43 males (86%) and seven females (14%) in the ratio of 6.1:1.0 with a mean age of 32.4 ± 11.6 years in the range of 19–66 years for both trauma and control groups. The patients in the third decade (54%) were the most affected age group, followed by those in the fourth decade (24%). Most of the patients were single [Table 1]. Table 2 shows that mandibular fracture alone (68%) was the most common fracture, followed by zygomatic complex (14%) while the least common was Le Fort fracture (4%). Seven subjects presented with fractures involving more than one bone. Table 3 shows the QoL of subjects with MF at presentation and that of the control. The mean overall QoL was 1.74 ± 0.53. Significantly, the psychological domain had the maximum score of 34.4 ± 15.1 while the social relationship domain had the lowest score of 23.0 ± 6.6. Similarly, psychological and social relationship domains had the maximum and the lowest scores, respectively, in the control group. The QoL was significantly lower for subjects with MF before treatment than for healthy controls in all the domains of WHOQOL-BREF. At 12 weeks after treatment, the QoL of patients improved significantly and there was no significant difference between the QoL of the treatment and control group except in psychological and social relationship domains [Table 4].

Age of subjects was associated with deterioration in QoL after MF [Table 5]. After the MF, there was no difference in the mean values of QoL at all the domains between males and females [Table 6]. Type and number of fractures sustained did not also affect the mean values of QoL across all the domains [Tables 7 and 8]. Physical health, psychological and social relationship domains scores were, however, significantly higher with increasing age [Table 5].

DISCUSSION

MFs are quite common. They often lead to facial disfigurement and dissatisfaction with appearance alongside the economic implications and issues relating to post-operative QoL.[2,16] Despite treatment of these facial fractures, pre-traumatic psychological state may not be achieved and the QoL of those affected is remarkably different from unaffected persons.[4,5] In this study, the peak age of occurrence of MF was amongst those <30 years, similar to other studies,[1,2] while some studies reported fourth decade, the second most common age in this study, as the peak age of incidence.[25,26] The possible explanation for the peak incidence in our study could be because this period is the most active phase of life and people in this age group may engage in risky behaviours, exercises and sports. Road traffic accident (RTA) is reportedly the leading cause of death in this age group.[26,27]

There was male preponderance in this study as comparable to previous studies.[2,28] This might be because males are often the breadwinners of the family in this part of the world and work outdoors, and thus, more likely to be involved in accidents leading to MFs.[23] Nevertheless, a dissenting report by Li *et al*.,[29] showed a higher prevalence of MFs in females with a male-to-female ratio of 1:1.07 in China. As equally reported by other studies, mandibular fracture was the most common MF in this study.[1,28] The mandible is more vulnerable due to its mobility, conspicuousness and its less bony support compared to the maxilla.[24] However, fracture of the nasal bone[30] and zygomatic complex fracture[25] were reported to be the most common MF by some researchers. As documented in other studies and also supported by our findings, the pre-treatment QoL of patients with MF was very poor in all the domains of WHOQOL-BREF when compared with the healthy controls.[4,13] After 12 weeks of treatment, there was a significant improvement in all the domains of WHOQOL-BREF except the persistent lower QoL in the psychological and social relationship domains compared to the healthy controls. This is also confirmed by the observations of other researchers.[4,5]

The occurrence of maxillofacial trauma scars serves as a constant reminder of the traumatic event and thus, it may directly cause the observed patients' lower quality of life

Table 1: Sociodemographic characteristics of the subjects with maxillofacial fracture and control group

Variables	Study (*n*=50), *n* (%)	Control (*n*=50), *n* (%)	χ^2	*P*
Age group				
<30	27 (54.0)	27 (54.0)	0.000	1.000
30–39	12 (24.0)	12 (24.0)		
≥40	11 (22.0)	11 (22.0)		
Mean±SD	32.4±11.6	32.4±11.6		
Gender				
Male	43 (86.0)	43 (86.0)	0.000	1.000
Female	7 (14.0)	7 (14.0)		
Marital status				
Single	27 (54.0)	27 (54.0)	0.000	1.000
Married	23 (46.0)	23 (46.0)		
Education				
Primary	2 (4.0)	2 (4.0)	0.000	1.000
Secondary	33 (66.0)	33 (66.0)		
Tertiary	15 (30.0)	15 (30.0)		
Employment status				
Employed	35 (70.0)	35 (70.0)	0.000	1.000
Unemployed	15 (30.0)	15 (30.0)		

SD: Standard deviation

Table 2: Pattern of maxillofacial fractures in 50 subjects

Variable	Frequency (*n*=50), *n* (%)
Mandibular fractures alone	34 (68.0)
Zygomatic complex fractures alone	7 (14.0)
Le Fort fractures alone	2 (4.0)
Combined fracture	7 (14.0)

following treatment compared with healthy controls.[26] Attempts have been made to identify factors that may increase the risk of having a lower QoL following traumatic injury compared to others with similar injuries and the normal population.[27] Identified factors have been grouped into 'potentially' modifiable factors such as pain, depression and psychologic distress and 'unmodifiable' factors such as age, gender, mechanism of injury, injury type and injury severity.[21]

In this study, increasing the age of the patients was associated with higher QoL. The QoL values in physical health, psychological and social relationship domains were significantly higher as the age increased with those <30 years having the lowest QoL. This is contrary to the outcome of other studies[16,18,27] where those who were older than 40 years had the worst psychological outcome. This finding may be because most subjects with ages <30 years are single and unemployed. They may come down with anxiety and depression believing that the fracture could affect their chances of getting married or

employed, and ultimately, their QoL. It has been documented that maxillofacial trauma and post-trauma unemployment and marital problems have a significant relationship.[16] In addition, older adults are said to cope better with life challenges than younger adults.[26]

In this study, there was no significant difference between the mean values of QoL at all the domains and gender as reported earlier by Anggayanti *et al.*,[31] but this contrasts with the outcome of other studies[18,21] where being a female is significantly associated with lower QoL and another study,[26] where being a male is a risk factor for poor QoL following maxillofacial trauma.[26] In the studies where females had lower QoL, the opinion was that the role of women as the main family carers in society could be limited following an injury. Olff[32] in her review concluded that 'Psychobiological reactions and effects of oxytocin model' could be used to explain why women tend to have poorer QoL than men. The author emphasised that women appear to have a more sensitised hypothalamus–pituitary–axis than men, while men appear to have a sensitised physiological hyperarousal system.[32] The lack of relationships between female gender and post-trauma QoL in this study could be because few female respondents participated in this study (0.14%) compared to those of the earlier studies.[18,21] The lower representation of the females might thus contribute to the result of the study.

Furthermore, the type and number of fractures sustained did not affect the mean values of QOL across all the domains. Earlier studies have reported varying outcomes. While some reported that types and numbers of fractures have inverse relationships with the overall QoL,[27,33] others reported an association with the physical domain part of the QoL alone.[34,35] Sluys *et al.*[36] in consonance with the outcome of this study, did not find any relationship between the severity of the trauma, the number and types of fracture and the overall QoL or its domains.[36] As explained by Brasel,[19] the differing observed association between the severity of trauma, measured by type and number of fractures, is due to the use of subjective categorisation of the patients' trauma rather than the patients' perceived injury severity.[23] Another plausible explanation is that assessment of severity is usually done long after the trauma occurred. This could blur the association, if ever, that might exist between the trauma severity and QoL.[36] The assessment of the relationship between QoL and the number and type of fractures in this study was done three months after the trauma and so this might be long enough to affect the observed outcome.

Table 3: Perceived quality of life of subjects (at presentation) and control groups

Variables	Study (*n*=50)	Control (*n*=50)	*t*	*P*
Overall QoL	1.74±0.53	3.96±0.40	23.68	0.001
Overall quality of health	1.74±0.5	4.68±0.51	27.26	0.001
Physical health domain	31.5±9.2	82.7±6.6	32.02	0.001
Psychological domain	34.4±15.1	84.8±6.6	21.60	0.001
Social relationship domain	23.0±6.6	64.4±8.1	9.66	0.001
Environment domain	29.3±6.6	65.6±7.0	26.62	0.001

QoL: Quality of life

Table 4: Perceived quality of life of subjects with maxillofacial fracture and control groups 12 weeks after treatment

Variables	Study (*n*=50)	Control (*n*=50)	*t*	*P*
Overall QoL	4.10±0.58	3.96±0.40	1.402	0.164
Overall quality of health	4.60±0.70	4.68±0.51	0.652	0.516
Physical health domain	83.36±5.81	82.7±6.6	0.548	0.585
Psychological domain	74.30±7.16	84.8±6.6	7.603	0.001
Social relationship domain	57.79±5.96	64.4±8.1	5.272	0.001
Environment domain	62.72±6.9	65.6±7.0	2.101	0.038

QoL: Quality of life

Table 5: Age and quality of life

Variables	*n* (%)	Physical	Psychological	Social	Environmental
Age group					
<30	27 (54.0)	29.0±7.3	30.0±12.7	22.5±4.9	29.2±6.7
30–39	12 (24.0)	31.3±8.9	33.4±14.5	20.3±8.4	27.1±4.9
≥40	11 (22.0)	37.7±11.5	46.1±15.1	27.3±7.0	32.0±7.8
F		3.904	5.163	3.624	1.621
P		0.027	0.009	0.034	0.209

Table 6: Gender and quality of life

Variables	n (%)	Physical	Psychological	Social	Environmental
Gender					
Male	43 (86.0)	32.4±8.6	35.9±14.8	23.3±6.5	30.0±6.1
Female	7 (14.0)	26.0±11.5	25.1±14.2	21.4±8.0	25.1±8.7
F		3.030	3.212	0.468	3.299
P		0.088	0.079	0.497	0.076

Table 7: Type of fracture and quality of life

Variables	n (%)	Physical	Psychological	Social	Environmental
Type of fracture					
Mandibular	34 (68.0)	31.2±9.3	35.5±16.4	22.2±7.3	29.1±6.2
Le Fort	2 (4.0)	37.5±9.2	31.0±0.0	22.0±4.2	31.0±0.0
Zygomatic	7 (14.0)	33.3±8.8	36.7±15.3	27.6±4.7	32.1±6.8
Mixed	7 (14.0)	29.7±10.1	27.7±8.7	23.3±4.5	27.0±6.6
F		0.460	0.595	1.335	0.753
P		0.711	0.622	0.275	0.527

Table 8: Number of fractures and quality of life

Variables	n (%)	Physical	Psychological	Social	Environmental
Number of fractures					
One	37 (74.0)	32.2±9.3	36.9±16.4	23.0±7.5	30.1±6.5
Two	11 (22.0)	28.6±8.6	26.1±5.9	23.4±3.9	25.6±6.5
Three	2 (4.0)	34.5±13.4	34.5±15.1	22.0±4.2	34.5±5.0
F		0.779	2.284	0.036	2.714
P		0.465	0.113	0.964	0.077

Conclusion

MF significantly impacts all the QoL domains before treatment and persistently affects the psychological and social domains even after surgical interventions. Prompt management is essential to improve the prognosis and well-being of the affected. Furthermore, the identification of predictors that lead to deterioration of QoL (like lower age group, as found in this study) amongst patients with MF is needed to develop effective integrated multidisciplinary management protocol for the patient as survivors will also require the psychiatrist and psychologist for holistic care and better treatment outcome.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

There are no conflicts of interest.

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Appendix

Appendix I: WHOQOL-BREF (2010) showing the 4 Domains	
Domain	**Facets incorporated within domains**
1. Physical health	Activities of daily living
	Dependence on medicinal substances and medical aids
	Energy and fatigue
	Mobility
	Pain and discomfort
	Sleep and rest
	Work Capacity
2. Psychological	Bodily image and appearance
	Negative feelings
	Positive feelings
	Self-esteem
	Spirituality/Religion/Personal beliefs
	Thinking, learning, memory and concentration
3. Social relationships	Personal relationships
	Social support
	Sexual activity
4. Environment	Financial resources
	Freedom, physical safety and security
	Health and social care: accessibility and quality
	Home environment
	Opportunities for acquiring new information and skills
	Participation in and opportunities for recreation/leisure activities
	Physical environment (pollution/noise/traffic/climate)
	Transport

Appendix II: WHOQOL-BREF (2010) Components

Questions	WHOQOL-BREF Items	Very poor	Poor	Neither poor nor good	Good	Very good
1	How would you rate the quality of life?	1	2	3	4	5

Questions	WHOQOL-BREF Items	Very Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied
2	How satisfied are you with your health?	1	2	3	4	5

Questions	WHOQOL-BREF Items	Not at all	A little	A moderate amount	Very much	An extreme amount
3	How much do you feel that pain prevents you from doing what you need to do?	1	2	3	4	5
4	How much do you need medical treatment to function in your daily life?	1	2	3	4	5
5	How much do you enjoy life?	1	2	3	4	5

Questions	WHOQOL-BREF Items	Not at all	A little	A moderate amount	Very much	Extremely
6	To what extent do you feel life to be meaningful?	1	2	3	4	5
7	How well are you able to concentrate?	1	2	3	4	5
8	How safe do you feel in your daily life?	1	2	3	4	5
9	How healthy is your physical environment?					

Questions	WHOQOL-BREF Items	Not at all	A little	Moderately	Mostly	Completely
10	Do you have enough energy for everyday life?	1	2	3	4	5
11	Are you able to accept your bodily appearance?	1	2	3	4	5
12	To what extent do you have enough money to meet your needs?	1	2	3	4	5
13	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5
15	How well are you able to get around?	1	2	3	4	5

Questions	WHOQOL-BREF Items	Very Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied
16	How satisfied are you with your sleep?	1	2	3	4	5
17	How satisfied are you with your ability to perform daily living activities?	1	2	3	4	5
18	How satisfied are you with your capacity for work?	1	2	3	4	5
19	How satisfied are you with yourself?	1	2	3	4	5
20	How satisfied are you with your personal relationships?	1	2	3	4	5
21	How satisfied are you with your sex life?	1	2	3	4	5
22	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24	How satisfied are you with your access to health services?	1	2	3	4	5
25	How satisfied are you with your transport?	1	2	3	4	5

Questions	WHOQOL-BREF Items	Never	Seldom	Quite often	Very often	Always
26	How often do you have negative feelings, such as blue mood, despair, anxiety, depression?	1	2	3	4	5