IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 6, Issue 6 Ver. IX. (Nov.- Dec .2017), PP 35-43
www.iosrjournals.org

Effect of jaw exercises training program on minimizing post-operative complications for patients with mandibular fracture

Samia Yousf Said[1], Hanan Mohamed Younis [2]
[1]*Lecturer, Medical Surgical Nursing, Faculty of Nursing, Assiut University, Egypt.*
[2]*Lecturer, Medical Surgical Nursing, Faculty of Nursing, Cairo University, Egypt. Current work: Taibah University.*

Abstract: *The present study **aimed** to investigate the effect of jaw exercises training program on minimizing post-operative complications for patients with mandibular fracture. **Design**; A quasi-experimental design. **Setting;** data were collected from trauma department and maxillofacial surgery outpatient clinic at Assiut University Hospital. **Sample:** A purposive (60) adult patients with mandibular fracture, the age between (18 to 65) years who were randomly divided into study and control group. The study group received jaw exercise training program, while the control group received routine hospital care. Data were collected through: three **tools;** 1) An interview questionnaire sheet, 2) Assessment patient knowledge about Jaw exercises, and 3) Assessment of post-operative complications. **Results;** There was statistically significant difference between study and control groups post implementing jaw exercises training program as regard level of knowledge & decrease late complications. **Conclusion;** after implementation of jaw exercises program patients of study group had improvement in their level of knowledge, decrease of post-operative complications while in control group showed increased these complications. **Recommendations;** Simple illustration, pamphlets & booklets should be available for illiterate patients to provide them with simple explanation about jaw exercises to decrease complications related to mandibular fracture.*

Key Words: *Complications, Exercises, Fractures, Mandibular, Post-operative, Training program.*

Date of Submission: 18-12-2017 Date of acceptance: 30-12-2017

I. Introduction

The mandible is considered as one of the facial bones of the head and is the simplest first-rate moveable bone of the face. It participates in simple functions which includes mastication, phonation, swallowing and upkeep of dental occlusion. The mandible interfaces with the cranium base through the temporomandibular joint and is held in role via the muscle mass of mastication. . It's the most important and strongest of all facial bones. On the time of delivery, the mandible consists of paired right and left bones; however those fuse collectively inside the course of the primary 12 months to shape the single U-shaped mandible of the grownup skull **(Gray & Standing, 2008).**

Mandibular fractures are breaks thru the mandibular bone. The mandible is the second one commonly fractured a part of the maxillofacial skeleton, typically occur due to trauma and are often associated with different facial trauma. Fractures of the mandible can be in any a part of the subsequent sites: coronoid, condyle, ramus, angle, body, parasymphysis, symphysis and alveolus**(Flint et al., 2014).**

Intraoral manifestations; bleeding from the gingiva, an open chew, bruising in the floor of the mouth (sublingual ecchymosis), Jaw tenderness or ache worse with biting or chewing, loss or broken tooth, dental fracture, teeth avulsion, malocclusion (upper and lower teeth do no longer line up nicely) **(Fonseca et al., 2012)** primary complications are airway lockage,bleeding, trouble speaking, infection, delayed union and nonunion, malunion, ankyloses, tooth loss, trismus, deviation, unsightly scars and impaired function of temporomandibular joint and anesthesia of lower lip and chin as consequences of nerve damage . Normal bony union of mandible takes region over four - 8 weeks, depending on the age of the affected person. **(Ambreen & Shah, 2001, Flint et al., 2014).**

Treatment of fractures requires recuperation of the elements to heir ordinary anatomical positions (reduction of a fracture) and immobilization (fixation) of the parts for about 6 to eight weeks till a union between the bony parts takes place. Reduction of the fracture can be either closed or opened. In a closed reduction, the bone segments are anipulated lower once more into location with out surgically exposing the bone. Arch bars and wires are commonly used for fixation. In an opened reduction, the fractured bone segments are surgically exposed, use twine or metallic plates to maintain the segments in near approximation (Donald & Sykes, 2009)

The nurse gives instructions that encompass health education for patients with intermaxillary fixation (IMF) approximately the following: nutrients, oral hygiene, keeping everyday jaw exercise (Physiotherapeutic exercising), continuation of treatment, and prevent of alcohol, smoking and other addictive drugs. All ingredients should be in a liquid shape, skinny sufficient to undergo a syringe or drink from a glass. Clean mouth after every meal to prevent infections. Failure to comply with those commands should result in needless pain, delay in recuperation or complications; which can negatively affect the outcome of treatment. Following surgical treatment jaws can be held collectively with elastics. A period of 2-6 weeks is commonly required for initial bone recovery (Stephanie et al., 2016).

Nurse play a vital role about the post operative care of closed or open reduction to reduce complications included physiotherapeutic jaw exercises as opening and closing, lateral movements and gum chewing exercises have been described as successful treatments to avoid complications as temporomandibular joint (TMJ) stiffness and trismus. Patients were assessed weekly until healing of bone (Subhashraj et al., 2007).

Jaw exercises; the fixation of jaws may be released step by step over numerous weeks. Following removal of fixation, patient will possibly able to open mouth some millimeters. This is in part because of the stiffness of the muscle tissues and the surgical site and in element due to the period of time the jaws have been held together. The range of motion in jaw will increase regularly because the stiffness decreases. Patients may be sent to a physiotherapistafter removaloffixationto similarly assist in enhancing jaw feature if movement ofjawis gradual or difficult. Patient will locate afew difficulties in shifting jaw normally after surgery (Kolahi & Shayesteh, 2013).

Specific exercises are not recommended during the first week to ten days after surgery. Jaw exercises can be performed between elastic changes. This would involve opening and closing the lower jaw, moving the lower jaw side to side, tongue depressors can be used to (open mouth to point of stiffness, place tongue blades on back teeth to open mouth, do not open into pain, slowly progress by adding more tongue depressors, as pain allows, perform five repetitions, three times a day and hold stretch for 5-10 minutes), chewing gums also help in jaw opening, do exercise in front of a mirror and perform five repetitions, three times a day. Physical therapy rehabilitation is essential for accomplishing good outcomes that include restoration of pre-occlusion, mouth opening, pain free mouth opening, full range of mandibular excursion, and facial and mandibular symmetry (Stephanie et al., 2016).

Significance of the study:

Delayed union and nonunion, malunion are a major of post-operative complications of mandibular fracture. Many worldwide research studies indexed on maxillofacial trauma is a major cause of mortality and morbidity worldwide **(Chrcanovic et al., 2004)**. Mandibular fractures are one of the most common facial fractures. Approximately 500 patients admitted in trauma unit at Assiut University Hospital according to hospital record 2015. From the researcher's clinical experience in the surgical unit has been observed that the patients with mandibular fracture needed special jaw exercises training to decrease post-operative complications.

Aim of this study was:

To investigate the effect of jaw exercises training program on minimizing post-operative complications for patients with mandibular fracture.

II. Subjects and Method

Research design:

Quasi- experimental design was utilized to conduct this study.

Setting:

The study was conducted in the trauma department and maxillofacial surgery outpatient clinic at Assiut University Hospital.

Subjects:

A convenience sample of 60 adult patients of both sexes in the trauma department and maxillofacial surgery outpatient clinic at Assiut University Hospital. Age ranges from 18 to 65 years. Patients assigned randomly into two equal groups (study and control) 30 patients for each. The study group received the jaw exercise training while the control group received the routine hospital care.

Tools:

Two tools were used in this study and developed by the researcher to collect the necessary data for this study.

Tool (I): An interview questionnaire sheet: to assess demographic data, medical data and knowledge regarding jaw exercises. It was developed by the researcher based on literature review.

This tool will consist of three parts:-

Part (1): Demographic data for patients as (name, age, gender, marital status, level of education and occupation).

Part (2): Present health history: it covers the following:

- **Causes of mandibular fracture (Causes of trauma):** included road traffic accidents (motor cycle and motor car accidents), fire arm injury, fall from height, industrial accidents, interpersonal violence, sports accidents, animal kick and home accidents.
- **Signs and symptoms of mandibular fracture:** included pain, swelling, bleeding, facial bruising, limited jaw movement, malocclusion, step deformity, tenderness, diminished or altered sensation to lower lip (numbness) and loose or damaged teeth.

Part (3): Assessment patient knowledge about jaw exercises; assess patient knowledge about jaw exercises as importance of these exercises, how many times and when theses exercises must applied, types and techniques of jaw exercises.

Scoring system: As regard patient assessment knowledge about jaw exercises which included 5 items, each item was observed, categorized and scored into either yes = 1 or no = 0 on all items.

- Total score divided into satisfactory $\geq 60\%$
- Unsatisfactory $< 60\%$

Tool (II): Assessment of post-operative complications: It was designed based on related literature to observe post-operative complications. the observation was performed to evaluate the effect of jaw exercise training on minimizing post-operative complications for patients with mandibular fracture during hospitalization and follow up for 2 weeks then 4 weeks post discharge to observe late complications such as (accommodation of feeding, difficulty talking, periodontitis, gingivitis, wound infection, temporomandibular joint painful movement, malocclusion, injury to inferior alveolar nerve, injury to mental nerve, malunion, nonunion).

Jaw exercises training program: include opening and closing, lateral movements and chewing exercises. This would involve opening and closing the lower jaw, moving the lower jaw side to side, is used tongue depressors and chewing gums help in jaw opening. Using tongue depressors to open mouth to point of stiffness, place tongue blades on back teeth to open mouth, do not open into pain, slowly progress by adding more tongue depressors, as pain allows, hold stretch for 5-10 minutes, do exercise in front of a mirror and perform five repetitions, three times a day.

III. Methods of data collection

1. **Administrative approval:**
   Official permission was obtained from the head of maxillofacial surgery department to conduct the study, the aim of the study and jaw exercises training was explained to them to obtain their cooperation.
2. **Validity:**
   The tools were tested for content validity by 5 expertises surgical and nursing staff, modifications were done accordingly then the tools were designed in its final format and tested for reliability using internal consistency for all of tools which was measured using Cronbach test, the tools proved to be reliable (0.73).
3. **Ethical consideration:**
   The study was approved by an institutional ethics committee, Patient's agreement for voluntary participation was obtained and the purpose and nature of the study was explained. The researcher initially introduced themselves to all patients and they were assured that the collected data were absolutely confidential. They were informed that participation is voluntary and they can withdraw at any time of the study.
4. **A pilot study:**
   A pilot study was conducted on 10 % (6) of patients to evaluate the applicability and clarity of tools. According to this pilot study, the required modifications were made and those patients who were involved in the pilot study were included in the study.
5. **Data collection:**
   The data were collected over a period of one year starting from January 2016 till the end of December 2016. The data collection was done in the following phases:

Assessment phase:

The researcher interviewed the patients individually and took their oral consent to participate and each patient was asked to answer interview questionnaire sheet. Initial assessment of the patient was done and recorded. The mouth was inspected for bleeding, edema or ecchymosis and teeth were checked.

Implementation phase:

Jaw exercise training program sessions:

- **Jaw exercise training program sessions:**

The Jaw exercise training had been carried out for the study group in term of sessions during two days preoperatively. The Jaw exercise training sessions aimed to evaluate the effect of jaw exercises training on minimizing post-operative complications for patients with mandibular fracture. The Jaw exercise training was developed by the researchers based on the review of relevant literature and available resources. There were a total three sessions were conducted for each patients, each session ranged between (20 - 30) minutes except for the session of discharge instruction, which took 60 minutes. Each session usually started by a summary of what had been taught during the previous session and the objectives of the new session. After each session there was 10 minutes for discussion and gave feedback. Reinforcement of teaching was performed according to patient's needs to ensure their understanding. Each patient in the study group obtains a copy of the Jaw exercise training booklet. The researcher used pictures for illustration, diagram, and video to educate the patient.

- **The first session:** Was started during first 24 hours post admission preoperatively after patient's hemodynamic stability, it contains two parts:
  Part 1: Information about the importance of exercises; used to prevent complications, such as delayed union and nonunion, malunion, ankyloses, tooth loss, trismus, deviation, unsightly scars and impaired function of temporomandibular joint and anesthesia of lower lip and chin as results of nerve injury.
  Part 2: Information about the types of exercises; opening and closing, lateral movements and chewing exercises. No recommended any specific exercises during the first week to ten days after surgery. Jaw exercises can be performed between elastic changes. This would involve opening and closing the lower jaw, moving the lower jaw side to side, using tongue depressors and chewing gums also help in jaw opening.
- **The second session:** Was started after 24 hours post admission preoperatively, it contains two part:
  Part 1: Information about perform the fixation of jaws will be released gradually over several weeks. Following removal of fixation, patient will probably only is able to open mouth a few millimeters. This is partly due to the stiffness of the muscles and the surgical site and in part due to the length of time the jaws have been held together. The range of movement in jaw will increase gradually as the stiffness decreases.
  Part 2:teach patient how to perform jaw exercises such as opening and closing the lower jaw, moving the lower jaw side to side, using tongue depressors (open mouth to point of stiffness, place tongue blades on back teeth to open mouth, do not open into pain, slowly progress by adding more tongue depressors, as pain allows, perform five repetitions, three times a day and hold stretch for 5-10 minutes), and chewing gums also help in jaw opening, do exercise in front of a mirror and perform five repetitions, three times a day.
- **The third session: Patients instructions:**
  Recommended that affected patient sleep with head on or three pillows. This facilitates to decrease the swelling in face and will also make it easier to breath. Keep away from doing whatever that calls for heavy lifting, pushing or straining at the same time while jaws are wired together. Do not try to work jaw backward and forward towards the wires. This could loosen the wires and teeth and prevent the bones from healing. Keep away from water associated sports which includes swimming and water-skiing at the same time as jaws are are wired as it's difficult to clean water out of nose and airway. Do no longer drink alcoholic liquids whilst jaws are wired. Use saline nasal spray as often as necessary to hold nose clear. Inform thepatient approximately follow up visit schedule to observ e and record the development of post operative complications.

Evaluation phase:

The last phase of proposed jaw exercises training program is the evaluation phase. In which the patients was evaluated after two weeks by the researcher after jaw exercises implementation as well as after four weeks later through filling the second tool.

Statistical analysis:

The data were tested for normality using the Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (N, %), where continuous variables described by mean and standard deviation (Mean, SD). Chi-square test and fisher exact test used to compare between categorical variables where compare between continuous variables by t-test. A two-tailed $p < 0.05$ was considered statistically significant. All analyses were performed with the IBM SPSS 20.0 software.

IV. Results

Table (1): Distribution of the demographic characteristics of both study and control groups (n= 60).

Variable	Study (n= 30)		Control (n= 30)		P. value
	No.	%	No.	%	
Age:					
18-29 years	16	53.3	15	50.0	
30-39 years	8	26.7	5	16.7	
40-49 years	2	6.7	5	16.7	0.724
50-59 years	1	3.3	3	10.0	
60-65 years	3	10.0	2	6.7	
Mean ± SD	31.47±12.62		32.6±13.55		0.739
Gender:					
Male	23	76.7	24	80.0	0.754
Female	6	20.0	7	23.3	
Marital status:					
Single	15	50.0	13	43.3	
Married	11	36.7	16	53.3	0.545
Widowed	3	10.0	1	3.3	
Education level:					
Illiterate	8	26.7	8	26.7	
Read and write	2	6.7	2	6.7	
Primary school	0	0.0	1	3.3	0.892
Preparatory school	3	10.0	4	13.3	
Secondary school	11	36.7	9	30.0	
University	6	20.0	6	20.0	
Occupation:					
Un employee	4	13.3	3	10.0	
Drivers	6	20.0	9	30.0	
Farmer	7	23.3	5	16.7	0.854
Student	6	20.0	7	23.3	
House wife	3	10.0	4	13.3	
Employer	4	13.3	2	6.7	

Table (1): The table reveals that, about half of the sample of the study and control group their age ranged between 18-29 years old, with mean of (31.47±12.62 and 32.6±13.55) respectively. About three quarter of the study group were males 76.7%, single 50%, have secondary school 36.7% and farmer 23.3%. While about three quarter of the control group were males 80.0%, married 53.3%, illiterate 26.6% and drivers 30.0%.

Table (2): Distribution of samples according to causes of mandibular fracture for the study and control groups (n = 60).

Causes of mandibular fracture	Study (n = 30)		Control (n = 30)		P. value
	No.	%	No.	%	
Road traffic accidents:	15	50.0	18	60.0	
Motor cycle accidents	8	23.3	12	36.7	0.672
Motor car accidents	7	16.7	6	20.0	
Fall from height	10	33.3	6	20.0	0.381
Interpersonal violence	3	10.0	3	10.0	1.000
Home accidents	2	6.7	3	10.0	0.666

Table (2): this table illustrated that, the causes of mandibular fracture, half of the study and more half of the control group. The fracture occurred as results of road traffic accident (50.0% and 60.0 %) respectively. There was no significant difference related to causes of mandibular fracture between both groups.

Table (3): Distribution of patients according to signs and symptoms of mandibular fracture for the study and control groups (n = 60).

Signs and symptoms of mandibular fracture	Study(n = 30)				Control(n = 30)				P. value
	Present		Absent		Present		Absent		
	No.	%	No.	%	No.	%	No.	%	
Pain	30	100	0	0.0	30	100.0	0	0.0	-
Swelling	30	100	0	0.0	30	100.0	0	0.0	0.313
Bleeding	22	73.3	8	26.7	17	56.7	13	43.3	0.176
Facial bruising	28	93.4	2	6.6	30	100.0	0	0.0	0.313
Limited jaw movement	30	100	0	0.0	30	100.0	0	0.0	-
Malocclusion	15	50.0	15	50.0	13	43.3	17	56.7	0.436
Step deformity	10	33.3	20	66.7	9	30.0	21	70.0	0.781
Tenderness	30	100.0	0	0.0	30	100.0	0	0.0	-

Diminished or altered sensation to lower lip (Numbness)	10	33.3	17	56.7	15	50	15	50	0.284
Loss or damaged teeth	17	56.7	13	43.3	22	73.3	8	26.7	0.176

Table (3): This table mentioned that, all of the patients in both groups had pain, swelling, limited jaw movement & tenderness (100%). While the patients in control group more than study group as regard facial bruising, diminished or altered sensation to lower lip (Numbness) & loss or damaged teeth (100%, 50%, & 73.3%) respectively

Table (4): Level of patients knowledge about jaw exercises between both groups pre & post implementing jaw exercises training program (n = 60).

Variable	Pre								P. value	post								P. value
	Study (n = 30)				Control (n = 30)					Study (n = 30)				Control (n = 30)				
	Yes		No		Yes		No			Yes		No		Yes		No		
	N.	%	N.	%	N.	%	N.	%		N.	%	N.	%	N.	%	N.	%	
Definition of jaw exercises.	0	0.0	30	100	0	0.0	30	100	-	28	93.3	2	6.7	2	6.7	28	93.3	0.001**
Importance of jaw exercises.	0	0.0	30	100	0	0.0	30	100	-	26	86.7	4	13.4	1	3.3	29	96.7	0.001**
Types of jaw exercises.	0	0.0	30	100	0	0.0	30	100	-	30	100	0	0.0	0	0.0	30	100	0.001**
Time do these exercises.	0	0.0	30	100	0	0.0	30	100	-	25	83.3	5	16.5	3	10.0	27	90	0.001**
Techniques of jaw exercises.	0	0.0	30	100	0	0.0	30	100	-	29	96.7	1	3.3	2	6.7	28	93.3	0.001**

* Statistically significant difference (p<0.05)
** Statistically significant difference (p<0.01)

Table (4): They are equally in both groups and they haven't any knowledge about jaw exercises in pre implementing jaw exercises training program. While there are statistically significant differences for the study group post implementing jaw exercises training program.

Table (5): Comparison between study and control groups total score of knowledge level pre and post implementing jaw exercises training program (n = 60).

	pre				P. value	post				P. value
	Study (n=30)		Control (n=30)			Study (n=30)		Control (n=30)		
	N.	%	N.	%		No.	%	No.	%	
level of Knowledge: Satisfactory	7	23.3	1	3.3	0.023*	27	90.0	4	13.3	<0.001**
Unsatisfactory	23	76.7	29	96.7		3	10.0	26	86.7	

* Statistically significant difference (p<0.05) ** statistically significant difference (p<0.01)

Table (5): the table mentioned that, there are statistically significant differences between both groups as regard level of knowledge pre and post jaw exercises training program.

Table (6): percentage distribution of late complications for both study and control group during hospitalization, 2 & 4 weeks after discharge (n = 60).

Complications	Study (n = 30)		Control (n = 30)		P. value
	No.	%	No.	%	
1-Accomodation of feeding:					
During hospitalization	29	96.7	30	100.0	0.313
2 weeks after discharge	3	10.0	22	73.3	0.000**
4 weeks after discharge	0	0.0	5	16.7	0.020*
2-Difficulty talking:					
During hospitalization	24	80.0	25	83.3	0.739
2 weeks after discharge	3	10.0	3	10.0	1.000
4 weeks after discharge	0	0.0	1	3.3	0.313
3-Periodontitis:					
During hospitalization	2	6.7	1	3.3	0.991
2 weeks after discharge	0	0.0	5	16.7	0.061
4 weeks after discharge	0	0.0	4	13.3	0.121

Complications	Study (n = 30)		Control (n = 30)		P. value
	No.	%	No.	%	
4-Gingivitis:					
During hospitalization	7	23.3	3	10.0	0.166
2 weeks after discharge	5	16.7	9	30.0	0.222
4 weeks after discharge	0	0.0	5	16.7	0.020*
5-Wound infection:					
During hospitalization	8	26.7	16	53.3	0.035*
2 weeks after discharge	6	20.0	18	60.0	0.002**
4 weeks after discharge	0	0.0	5	16.7	0.020*
6-Temporomandibular joint painful movement:					
During hospitalization	1	3.3	1	3.3	1.000
2 weeks after discharge	15	50	17	56.7	0.794
4 weeks after discharge	2	6.7	5	16.7	0.422
7-Malocclusion:					
During hospitalization	13	43.3	8	26.7	0.176
2 weeks after discharge	10	33.3	11	36.7	0.787
4 weeks after discharge	1	3.3	2	6.7	0.554
8- Injury to inferior alveolar nerve:					
During hospitalization	11	36.7	8	26.7	0.405
2 weeks after discharge	17	56.7	12	40.0	0.196
4 weeks after discharge	17	56.7	11	36.7	0.121
9-Injury to mental nerve:					
During hospitalization	4	13.3	1	3.3	0.161
2 weeks after discharge	9	30.0	4	13.3	0.117
4 weeks after discharge	9	30.0	4	13.3	0.117
10-Malunion:					
During hospitalization	0	0.0	0	0.0	-
2 weeks after discharge	0	0.0	4	13.3	0.038*
4 weeks after discharge	0	0.0	0	0.0	-
11-Nonunion:					
During hospitalization	0	0.0	5	16.7	0.061
2 weeks after discharge	3	10.0	10	33.3	0.060
4 weeks after discharge	0	0.0	2	6.7	0.469

Table (6): This table illustrated that, there are statistically significant difference between study and control group as regards late complications such as accommodation of feeding after 2 and 4 weeks after discharge (P. value = 0.000**, 0.020*), gingivitis 4 weeks after discharge (P. value = 0.020*), wound infection during hospitalization, after 2 and 4 weeks from discharge (P. value = 0.035*, 0.002**, 0.020*), and malunion after 2 weeks from discharge (P. value = 0.038*).

V. Discussion

Mandibular fractures are the most commonplace fractures encountered in maxillofacial trauma after nasal fractures. The most commonplace reasons of mandibular fractures are street site accidents, falls, missile injuries, and attack and sport . The fractures of the mandible require early diagnosis, rapid and proper treatment and possible rehabilitation for optimum outcomes **(Gandhi et al., 2011)**.

In the present study about half of the sample of the both study and control group their age range between 18-29 years old. This finding in consistent with **(Gareh et al., 2016, De Matos et al., 2010, Thorén et al., 2010, Ravindran and Ravindran Nair 2011)** the incidence of mandibular fractures was higher in age group between 18 to 29 years. Also disagree with **(Lieger et al., 2009)** who stated that the highest incidence of maxillofacial fractures is between the ages of 31 and 40. According to **(Bormann et al., 2009)** who mentioned that there was a high incidence of mandibular fractures in young populations.

In the present study the three quarter of the study group were males more than female which is in the same line with **(Subhashraj et al., 2007)**. From the opinion of researcher because most men worker as drivers and participate in everyday activities that require more physical activity and used different methods of transportations.

The present study mentioned that half of the study and more half of the control group their mandibular fractures had been consequences from road traffic accident and fall from height was the second cause, this are in agreement with **(Gareh et al., 2016, & Sakr et al., 2006)** and disagree with **(Lamphier et al., 2003)** who reported that, the interpersonal violence was the main cause, as in the developed countries where the interpersonal violence appear to be the maximum common cause of mandibular fractures, while in developing countries the most common cause is the road traffic accidents **(Subhashraj etal., 2007**).

In the developing countries there is an ongoing migration from the rural to the busy urban environment where traffic volumes have increased rapidly and the infrastructure (e.g., road construction) is weak. Seat belts or helmets are not so widely accepted and deficiency in road traffic legislations, car maintenance, poor roads and bad driving; factors all contributing to a high incidence of road traffic accidents associated injuries **(Ravindran & Ravindran Nair, 2011)**.

As regard signs and symptoms of mandibular fractures the current study showed that all of the patients in both groups suffer from pain, swelling, limited jaw movement & tenderness, in agreement with **(Schneider et al., 2008)** who suggested that less movement in the injured area results in less soft tissue edema.

The present study mentioned that, there were statistically significant differences between study and control group after implementing jaw exercises training program as regard knowledge level of patients about jaw exercises. This results in the same line with **(Gareh et al., 2016**) who reported that there are statistically significant differences between study and control group after implementing nursing teaching protocol as regard knowledge level of patients about jaw exercises. In my opinion jaw exercises affect positively on patients outcomes and reduce incidence of complications as cleared in this study, the complications of study group decreased with applying jaw exercises training program.

The present study showed there were statistically significant difference between study and control group as regards late complications such as accommodation of feeding after 2 and 4 weeks from discharge, gingivitis after 4 weeks from discharge, wound infection during hospitalization, after 2 and 4 weeks from discharge, and malunion after 2 weeks from discharge, these results in agreement with **(Gareh et al., 2016**, **Fox and Kellman, 2003)** who mentioned that infection contribute significantly to the high prevalence of delayed and nonunion and the high incidence of infection. Also the present study reported statistically significant difference between study and control groups as regard malunion after 2 weeks from discharge in agreement with **(Lamphier et al., 2003)** who stated that early jaw movement and not following instructions increase incidence of malunion.

VI. Conclusions

Patients' levels of knowledge about jaw exercises were inadequate. After implementation of jaw exercises program to study groups had improvement in their level of knowledge, decrease of post-operative complications while in control group these complications were increased.

VII. Recommendations

Simple illustration, pamphlets & booklets should be available for illiterate patients to provide them with simple explanation about jaw exercises to decrease post- operative complications. The patients must understand the importance of jaw exercises, and applying them.

References

[1]. **Ambreen, A. and Shah, R. (2001):** Causes of maxillofacial injuries - a three years study. J Surg Pak. 6(4):pp.25-27.

[2]. **Bormann, K.H., Wild, S., Gellrich, N.C., Kokemüller, H., Stühmer, C. (2009):** Five-year retrospective study of mandibular fractures in Freiburg, Germany: incidence, etiology, treatment, and complications. J Oral MaxillofacSurg. 67:pp.1251–1255.

[3]. **Chrcanovic, B.R., Abreu, M.H., Freire-Maia, B., et al.,(2012):** mandibular fractures: a 3-year study in a hospital in Belo Horizonte, Brazil. J Craniomaxillofac Surg. 40:pp.116–123.

[4]. **De Matos, F.P., Arnez, M.F.M., Sverzut, C.E. and Trivellato, A.E. (2010):** A retrospective study of mandibular fracture in a 40-month period. Int J Oral Maxillofac Surg., 39: pp.10-15.

[5]. **Donald, P. and Sykes, J. (2009):** Facial fractures. Ballenger's Otorhinolaryngology Head and Neck Surgery.16th ed.,chapter 39, p.907.

[6]. **Flint, P.W., Haughey, B.H., Robbins, K.T., Thomas, J.R., Niparko, J.K., Lund, V.J., et al. (2011):** Cummings otolaryngology-head and neck surgery:5th ed., Elsevier Health Sciences.chapter 2, pp.1390-1399.

[7]. **Fonseca, R.J., Barber, H.D., Powers, M.P., and Frost, D.E. (2012):** Oral & maxillofacial trauma, 4th ed., W B Saunders Co., chapter 3, pp. 676 – 680.

[8]. **Fox, A.J. and Kellman, R.M. (2003):** Mandibular Angle Fractures, Two Miniplate Fixation and Complications Arch Facial Plast., (6):pp.464-469.

[9]. **Gandhi, S., Ranganathan, L.K., Solanki, M., Mathew, G.C., Singh, I., and Bither, S. (2011):** Pattern of maxillofacial fractures at a tertiary hospital in northern India: a 4-year retrospective study of 718 patients. Dent Traumatol. 27:pp.257-562.

[10]. **Gareh F A, El-Dein S G, & Azer S Z, (2016):** Effect of Implementing Suggested Nursing Teaching Protocol on Patients' Outcomes with Mandibular Fracture. PP. 1, 48 – 51.

[11]. **Gray, H. and Standring, S. (2008):** Gray's anatomy: the anatomical basis of clinical practice, Churchill-Livingstone, 40th ed. Elsevier Health Sciences. chapter 4, p.397

[12]. **Kolahi, J. and Shayesteh, Y.S. (2013):** A textbook of advanced oral and maxillofacial surgery. Dental Hypotheses. 4(4):pp.151-152.

[13]. **Lamphier, J., Ziccardi, V., Ruvo, A. (2003):** Complications of mandibular fractures in an urban teaching center. J Oral MaxillofacSurg. 61:Pp.745-749.

[14]. **Lieger, O., Zix, J., Kruse, A. and Iizuka, T.(2009):** Dental injuries in association with facial fractures. J Oral Maxillofac Surg. 67:pp.1680-1684.

[15]. **Ravindran, V. and Ravindran Nair, K.S. (2011):** Meta-analysis of maxillofacial trauma in the northern districts of Kerala: One year prospective study. J Maxillofac Oral Surg. 10: pp.321-327.

[16]. **Sakr, K., Farag, I.A. and Zeitoun, I.M. (2006):** Review of 509 mandibular fractures treated at the University Hospital, Alexandria, Egypt. British Journal of Oral and Maxillofacial Surgery. 44(2):pp.107-111.

[17]. **Schneider, M. , Erasmus, F. , Gerlach, K.L., Kuhlisch, E. (2008):** Open renduction and internal fixation versus closed treatment and mandibulomaxillary fixation of fractures of the mandibular condylar process: a randomized, prospective, multicenter study with special evaluation of fracture level; J Oral Maxillofac Surg, 25:pp. 37-44.

[18]. **Stephanie, H., Scarlett, L., Rosanna, H. and Yemariam, D. Loudoun (2016):** Oral & Maxillofacial Surgery. Available from (https://www.loudounoms.com/patient-information/surgical instructions/orthognathic-surgery-pre-and-post-operative-instruction)

[19]. **Subhashraj, K., Nandakumar, N. and Ravindran, C. (2007):** Review of maxillofacial injuries in Chennai, India: a study of 2748 cases. British Journal of Oral and Maxillofacial Surgery. 45(8): pp.637-639.

[20]. **Thorén, H., Snäll, J., Salo, J., Suominen-Taipale, L., Kormi, E., Lindqvist, C. and Törnwall, J. (2010):** Occurrence and types of associated injuries in patients with fractures of the facial bones. J Oral Maxillofac Surg., 68:pp.805-810.

Samia Yousf Said "Effect of jaw exercises training program on minimizing post-operative complications for patients with mandibular fracture”.” IOSR Journal of Nursing and Health Science (IOSR-JNHS) , vol. 6, no.6 , 2017, pp. 35-43.