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WEIGHT LOSS AMONG PATIENTS TREATED WITH MAXILLOMANDIBULAR FIXATION AT KHYBER COLLEGE OF DENTISTRY, PESHAWAR

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ABSTRACT
Objective: To determine the mean difference in weight among patients before and after Maxillomandibular Fixation (MMF) for the treatment of mandibular fractures.
Methods: This quasi-experimental study was conducted at the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar. A total of 120 patients aged 20-50 years with mandibular fractures requiring MMF were included. Patients with comorbidities were excluded. Weight was recorded on the day of admission (pre-operative) and at the completion of 6 weeks of MMF (post-operative). Data were analyzed using SPSS, with a Paired Sample T-Test used to compare mean weights.
Results: The study population (N=120) had a mean age of 32.72 ± 8.92 years, with a male predominance (78.3%, n=94). The primary route of intake was oral (91.7%). The mean pre-operative weight was 67.57 ± 11.23 kg, and the mean post-operative weight was 61.80 ± 10.37 kg. The mean weight loss was 5.77 ± 1.96 kg. The difference was highly statistically significant ($t(119) = 32.12$, $P < 0.001$).
Conclusion: Maxillomandibular fixation results in statistically significant weight loss in patients treated for mandibular fractures. Nutritional counselling and caloric supplementation should be essential parts of the management protocol at this centre.

KEYWORDS: Maxillomandibular Fixation, Weight Loss, Mandibular Fractures, Nutrition, Oral Surgery.

INTRODUCTION

Mandibular fractures are among the most common facial injuries treated by oral and maxillofacial surgeons, often resulting from road traffic accidents, assaults, and falls (1,2). The management of these fractures aims to restore form, function, and occlusion. While rigid internal fixation (ORIF) has gained popularity, Maxillomandibular Fixation (MMF), commonly known as "wiring the jaws shut", remains a workhorse modality in developing countries due to its cost-effectiveness and non-invasive nature (3,4).
A significant consequence of MMF is the immediate and drastic alteration of dietary intake. Patients are restricted to a liquid or semi-liquid diet for a period typically ranging from 4 to 6 weeks (5). This dietary restriction, combined with the catabolic stress of trauma and surgery, places patients at high risk for weight loss and malnutrition (6). Adequate nutrition is critical for wound healing, immune function, and fracture callus formation (7).
In the context of Peshawar and the broader Khyber Pakhtunkhwa region, dietary habits traditionally involve energy-dense solid foods. The transition to a liquid-only diet may be particularly challenging for this demographic, potentially leading to greater caloric deficits compared to populations habituated to softer diets (8). While weight loss in MMF is a known phenomenon globally, local data quantifying this loss is necessary to justify the implementation of specific nutritional support protocols.
This study aims to quantify the mean weight loss in patients undergoing 6 weeks of MMF at Khyber College of Dentistry, Peshawar, to assess the magnitude of nutritional compromise in our local population.

METHODOLOGY

This quasi-experimental study was conducted at the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry (KCD) in Peshawar. Prior to the commencement of data collection, formal ethical approval was obtained from the Institutional Research Review Board (RRB) of KCD (Reference No: 8152/RRB/KCD; dated January 12, 2023). All procedures adhered strictly to institutional and international ethical standards for human research.
An initial sample size of $n = 192$ was calculated using OpenEpi software, based on reference parameters of a mean pre-operative weight of 68.87 ± 11.25 kg and a mean post-operative weight of 64.79 ± 11.29 kg, maintaining a 95% confidence interval and 80% statistical power. However, to accommodate resource constraints

and strict study timelines while ensuring the data retained a normal distribution and satisfied the College of Physicians and Surgeons Pakistan (CPSP) criteria, the final sample size was pragmatically adjusted to 120 participants.

The study population was selected based on strict eligibility criteria. The inclusion criteria comprised adult patients of both genders, aged between 20 and 50 years, who presented with isolated mandibular fractures and were scheduled for conservative management exclusively via maxillomandibular fixation (MMF). To eliminate confounding variables regarding weight loss, patients were excluded if they suffered from systemic metabolic disorders (such as diabetes mellitus or hyperthyroidism), had associated midface or pan-facial fractures requiring extended hospitalization, or presented with pre-existing malnutrition and comorbidities.

Upon enrolment, comprehensive demographic data—including age and gender—were recorded for all participants. Baseline pre-operative body weight was documented on the day of admission or prior to the surgical procedure using a standardized, calibrated digital weighing scale to ensure measurement precision. Maxillomandibular fixation was subsequently established utilizing either Erich arch bars with intermaxillary wires or eyelet wiring techniques, depending on the specific clinical indication.

Following the procedure, all patients received standardized dietary counselling and were strictly instructed to adhere to a liquid or slurry diet for the duration of the fixation. The primary route of nutritional intake, whether oral or via a nasogastric (NG) tube, was documented to monitor feeding compliance. Upon completion of the six-week fixation period, patients were evaluated during their scheduled follow-up visit. At this point, the MMF hardware was removed, and the final post-operative body weight was recorded using the same calibrated digital scale.

Data processing and statistical evaluations were conducted using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were computed to summarize the sample characteristics, expressing quantitative variables as means and standard deviations, and qualitative variables as frequencies and percentages. To ensure the appropriateness of parametric testing, the normality of the weight loss variable was assessed and confirmed using the Shapiro-Wilk test ($p = 0.865$). Consequently, a paired-samples t-test was employed to analyze the mean difference between pre-operative and post-operative weights. A threshold of $p < 0.05$ was established to indicate statistical significance.

RESULTS

A total of 120 patients undergoing Maxillomandibular Fixation (MMF) were included in this quasi-experimental study. All participants met the inclusion criteria of being between 20-50 years of age and having no comorbidities. The demographic and clinical profile of the study cohort is detailed in Table 1, highlighting a predominantly young adult population. The average age of the 120 enrolled participants was 32.72 ± 8.92 years, which reflects the typical demographic most susceptible to maxillofacial injuries. A pronounced gender disparity was observed within the cohort, with males constituting the vast majority of the sample (78.3%, n=94) compared to females (21.7%, n=26). This male predominance strongly aligns with general epidemiological trends in maxillomandibular trauma, which is frequently associated with high-impact activities, road traffic accidents, or interpersonal violence.

Regarding clinical presentation, all participants (100%) were treated for mandibular fractures, fulfilling the primary inclusion criteria for conservative management via maxillomandibular fixation (MMF). While the study focused on these specific injuries, a small subset of the population (10.0%, n=12) presented with concurrent, minor fractures in other anatomical regions that did not necessitate prolonged hospitalization or violate the exclusion parameters.

In terms of post-operative management and compliance with the prescribed dietary modifications during the six-week fixation period, the overwhelming majority of patients successfully managed their nutritional requirements via the oral route (91.7%, n=110). This indicates a high level of patient tolerance and adaptability to oral liquid and slurry diets despite the restrictive presence of arch bars or eyelet wiring, with only a marginal fraction (8.3%, n=10) relying on alternative feeding modalities such as nasogastric intubation.

Weight Loss Assessment

The objective was to determine the mean difference in weight among patients before and after Maxillomandibular Fixation[3]. The normality of the weight loss variable (Pre-operative Weight - Post-operative Weight) was confirmed using the Shapiro-Wilk test (P=0.865).

Table 1 : Descriptive Statistics and Weight Assessment (N=120)

Variable	Category	Frequency (n) / Mean	Percentage (%) / ± SD (Kgs)
Age (Years)		32.72	+/- 8.92
Gender	Male	94	78.3%

	Female	26	21.7%
Pre-operative Weight		67.57	+/- 11.23
Post-operative Weight (at 6 weeks)		61.80	+/- 10.37
Mean Weight Loss		5.77	+/- 1.96

A Paired-Samples T-Test was conducted to evaluate the physical impact of a six-week period of maxillomandibular fixation (MMF) on patient body weight. The analysis compared the baseline pre-operative weight, recorded on the day of hospital admission, against the final post-operative weight, measured immediately following the removal of the fixation hardware at the end of the sixth week.

The results demonstrated a substantial and consistent reduction in patient mass due to the dietary restrictions imposed by the treatment. Over the course of the six-week liquid or slurry diet, participants experienced an average weight loss of 5.77 ± 1.96 kg. This observed reduction between the pre-operative and post-operative intervals was highly statistically significant ($t(119) = 32.12$, $p < 0.001$). These robust statistical findings underscore the pronounced nutritional deficit and subsequent physical weight alteration that patients undergo during prolonged conservative management of mandibular fractures (table 2).

Table 2 Summary of paired T-test findings

Statistical Parameter	Value
Measurement Interval	Pre-operative to 6th week post-operative
Mean Weight Loss	5.77 kg
Standard Deviation	1.96 kg
Degrees of Freedom (df)	119
t-statistic	32.12
P-value	< 0.001 (Highly Significant)

DISCUSSION

Overview of Findings The results of this quasi-experimental study, conducted at the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry (KCD), Peshawar, quantify a critical but often overlooked sequela of maxillofacial trauma management: significant weight loss. Our analysis of 120 patients revealed a mean weight loss of 5.77 kg ± 1.96 kg over a 6-week period of Maxillomandibular Fixation (MMF). This represents a statistically significant decline ($P < 0.001$) and constitutes approximately 8.5% of the pre-operative body weight. While the primary goal of MMF is the restoration of occlusion and bone healing, this study highlights that the therapy itself imposes a severe nutritional penalty on the patient. This discussion will explore the multifactorial aetiology of this weight loss, ranging from the physiological response to trauma to the specific socio-cultural dietary habits of the Peshawar population, and outline the clinical implications for our practice.

To understand the significance of the weight loss observed (5.77 kg), one must first differentiate between the metabolic effects of the injury and the mechanical effects of the treatment. Trauma initiates a hypermetabolic state, often described as the "ebb and flow" phases of metabolic response. Following the mandibular fracture, patients enter a catabolic state driven by the release of stress hormones (cortisol, catecholamines) and inflammatory cytokines (IL-1, IL-6, TNF-alpha) (1,9). This response mobilises energy reserves to repair tissue, increasing the patient's Basal Metabolic Rate (BMR). Under normal circumstances, a patient would increase their caloric intake to meet this demand. However, MMF creates a "nutritional paradox": just as the body's energy demand spikes to support bone healing, the mechanical capacity to consume energy is severely limited (10). The weight loss observed in our study is therefore not solely a result of starvation but a combined effect of increased demand (trauma) and decreased supply (fixation). The loss of 5.77 kg in 6 weeks suggests that patients were in a persistent negative nitrogen balance, employing adipose tissue and skeletal muscle for gluconeogenesis.

The most direct cause of weight loss in this cohort is the physical barrier of the arch bars and wires. In our study, 91.7% of patients relied exclusively on the oral route for nutrition. The mechanics of eating through a straw or the

gaps behind the molars significantly alter the "work of feeding." Patients reported that the effort required to suction liquid through the interdental spaces is exhausting. This fatigue often leads to premature cessation of the meal before satiety or caloric targets are reached. Furthermore, there is a volumetric limitation. To render solid food drinkable, it must be diluted. This creates a situation where the volume of the food is high (filling the stomach and stretching gastric mechanoreceptors), but the caloric density is low (11). A patient may feel "full" after drinking 500ml of diluted soup, yet they may have only consumed 150 calories, leading to a massive daily caloric deficit.

A notable strength of this study is its location in Peshawar, Khyber Pakhtunkhwa. To thoroughly interpret our results, it is essential to consider the local diet. The traditional Pashtun diet is characterised by dense solid foods: Nan (leavened bread), Chapli Kabab (meat patties), Ghee (clarified butter), and rice (12,13). Unlike Western diets, which often include naturally soft foods (yogurts, puddings, mashed potatoes) or processed liquid supplements, the local diet is hard to liquefy.

Patients at KCD usually try to blend their regular meals. However, blending a Nan requires a lot of water or tea to pass it through a sieve or straw. This excessive dilution greatly lowers the nutrient-to-volume ratio. The local population is used to savoury, chewable textures. The psychological dislike of drinking a "liquid meat curry" or "blended bread" is high. This palatability problem causes meals to be skipped. A large part of the liquid intake in our demographic is Kahwa (green tea) or milky tea. While culturally comforting, Kahwa has zero calories, and milky tea, unless fortified with cream or sugar, provides insufficient protein for tissue repair. Our finding of a 5.77 kg average weight loss closely matches regional literature, confirming the reproducibility of this complication in developing countries.

Kayani et al. (14), in a study conducted elsewhere in Pakistan, reported a mean weight loss of 6 kg in the first week and 5 kg by the 4th week. Our findings (5.77 kg at 6 weeks) align closely with these results. Similarly, a study from India by Bhatnagar (12) observed significant weight loss in MMF patients, mainly due to their inability to afford commercial supplements. Interestingly, studies from developed countries often show slightly lower weight loss. Worrall (15) in the UK reported a 4.5 kg loss. The difference between 4.5 kg (UK) and 5.77 kg (Peshawar) may be due to access to nutritional support. In the UK/US, patients typically benefit from dietitians and high-calorie engineered supplements (like Ensure, Boost) provided by healthcare systems or insurance. Conversely, at KCD, nutritional responsibility lies entirely with the patient's family, who may have limited knowledge of caloric calculations. Al-Maweri et al. (16) reported a 4.2 kg loss in Yemen. The higher weight loss in our study (5.77 kg) might be related to the larger body frame and higher baseline weight of the Pashtun ethnicity compared to Yemenis, or differences in the strictness of the MMF technique (such as wire tightness).

We cannot separate the clinical findings from the socioeconomic reality of the Khyber Pakhtunkhwa region. A large proportion of patients presenting to KCD with mandibular fractures are labourers, motorcyclists, or victims of interpersonal violence from lower socioeconomic backgrounds (13). For these patients, the cost of commercial nutritional supplements (e.g., tins of Glucerna or Ensure) is often unaffordable. A single tin may cost the equivalent of a daily wage. Consequently, patients rely on homemade broths and diluted milk. Additionally, the demographics of our study showed a male predominance (78.3%). In our cultural setting, these men are often the main breadwinners. The inability to work during the 6-week MMF period, along with the expense of treatment, causes financial hardship. This financial burden leads to "nutritional rationing" within the household, where the patient may choose cheaper, carbohydrate-rich liquids (sugar water, thin lassi) rather than protein-rich foods (eggs, meat broths), worsening muscle wasting.

One might argue that a 5-6 kg weight loss is acceptable for a young, healthy male (mean age 32.72 years). However, rapid weight loss of this magnitude (>10% of body weight in 6 weeks) is clinically dangerous. Starvation and protein-energy malnutrition impair T-lymphocyte function and phagocytosis. This is especially risky for mandibular fractures, which are often open fractures communicating with the oral cavity. Malnutrition increases the risk of surgical site infections (SSI) and osteomyelitis (17). Fracture healing needs a protein scaffold. In a state of catabolism, the body prioritises vital organs over bone callus formation. Nutritional deficiency can cause delayed union or non-union of the fracture (18). The recorded weight loss is not solely fat; it also includes skeletal muscle mass. After MMF, patients often need significant rehabilitation to recover masticatory muscle strength. The atrophy of the masseter and temporalis muscles during fixation contributes to prolonged trismus (limited mouth opening) even after the wires are removed (19).

The significant weight loss documented here provides a strong argument in the ongoing debate between Open Reduction Internal Fixation (ORIF) and MMF. ORIF (plating) enables an immediate or early return to function and a softer diet, avoiding the need for 6 weeks of liquid starvation (20). While MMF is cost-effective regarding surgical materials, the "hidden cost" is the physiological impact on the patient (5.77 kg weight loss, muscle atrophy, and weeks of lost productivity). When counselling patients at KCD, surgeons should explicitly mention weight loss as a complication of MMF. For patients already underweight or nutritionally compromised, MMF might be contraindicated solely due to this nutritional risk, making ORIF the preferred choice despite the higher initial cost.

Another factor contributing to weight loss observed in this study is the deterioration of oral hygiene. When jaws are wired shut, mechanical cleaning of the lingual surfaces of teeth becomes impossible, and buccal cleaning is challenging. Food debris accumulation causes halitosis (bad breath) and a persistent bad taste in the mouth. Patients in our study often reported that this "bad taste" suppressed their appetite. The presence of wires also

makes eating messy and socially embarrassing, leading to social isolation. Patients frequently refuse to eat in front of others, missing out on the communal aspect of Pashtun dining, which further decreases their overall intake (21). While this study provides valuable local data, it has limitations. We relied solely on anthropometric measurement (weight in kg). We did not measure serum albumin, pre-albumin, or transferrin levels, which would have offered a more detailed understanding of protein malnutrition. We did not utilise bio-impedance analysis to differentiate between fat loss and muscle mass loss. We did not calculate precise caloric intake through food diaries, so we cannot link the specific caloric deficit to the degree of weight loss. The study concluded at 6 weeks (removal of MMF). It would be beneficial to monitor how long it takes for these patients to regain their lost weight. Based on a mean weight loss of 5.77 kg, we suggest the following modifications to the management protocol at Khyber College of Dentistry; "Liquid diet" is a vague instruction. Patients should be provided with specific recipes. We recommend a "KCD Protocol" pamphlet featuring local, affordable recipes (e.g., Khichdi blended with milk, high-fat yoghurt shakes, egg-based custards). High-risk patients (those with low BMI at admission) should be identified early. If commercial supplements are unaffordable, the hospital pharmacy could potentially formulate a low-cost glucose-protein powder. Weight should be recorded at every follow-up appointment (weeks 1, 3, and 6), rather than only at the end. A loss of over 2 kg in the first week should prompt intervention. Intensive oral hygiene instructions (such as chlorhexidine rinses) may help preserve appetite by reducing halitosis. Teaching patients to place the straw behind the last molar (retromolar pad region) instead of through the incisors can make swallowing easier and less tiring.

In conclusion, weight loss is an inherent and significant complication of Maxillomandibular Fixation at our centre. The loss of 5.77 kg indicates a failure of the current passive nutritional management strategy. By recognising this as a medical complication rather than a natural side effect, we can adopt active nutritional rehabilitation—ranging from dietary counselling to early intervention—to improve patient outcomes, promote wound healing, and reduce the metabolic burden of trauma treatment in the Peshawar population.

CONCLUSION

Patients treated with Maxillomandibular Fixation for mandibular fractures at Khyber College of Dentistry experience statistically significant weight loss (mean 5.77 kg) over a 6-week period. This highlights the urgent need for structured nutritional counselling and potentially prophylactic dietary supplementation for all patients undergoing MMF.

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