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Review

The psychological sequelae of maxillofacial trauma: a scoping review of the literature

Emma G Walshaw [a,*], Richard Taylor [a], Jane Anderson [b], Paul Sexton [c], Jiten D Parmar [c], Lachlan M Carter [c]

[a] *University of Leeds, Worsley Building, University of Leeds, Woodhouse, Leeds LS2 9JT, United Kingdom*
[b] *University of Huddersfield, Queensgate, Huddersfield HD1 3DH, United Kingdom*
[c] *Leeds Teaching Hospitals Trust, Leeds General Infirmary, Great George Street, Leeds LS1 3EX, United Kingdom*

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Abstract

Managing the physical sequelae of facial trauma is routine for the maxillofacial surgeon. However, managing the psychological consequences is more challenging. The often violent mechanism of injury, changes in appearance, altered self-perception, and self-confidence can significantly impact daily life. This review summarises the literature regarding post-traumatic stress disorder (PTSD) and facial trauma, highlighting evidence to guide clinical practice. PubMed and MEDLINE were searched for relevant keywords and MeSH headings. Articles between 2000-2022 were independently reviewed by two authors. Articles were excluded if the full text was not available in English, did not relate to facial trauma, or was not related to PTSD/psychological sequelae. A total of 211 articles were retrieved. The most common reasons for exclusion were papers not reporting psychological outcomes (n = 68) or not relating to facial trauma (n = 35). Articles were subcategorised to enable evaluation of key themes. Categories included children and adolescents, cross sectional, longitudinal studies, and interventional studies. Whilst there were potential confounders such as socioeconomic factors, overall, patients who had experienced facial trauma (regardless of the mechanism of injury) had an increased risk of PTSD and anxiety/depression. PTSD following facial injury is increasingly recognised as an important issue. A robust evidence base is desirable to inform clinical practice and provide holistic care to often vulnerable patients. Identifying those at increased risk of negative psychological sequelae is essential. We have appraised the literature relevant to OMFS trauma clinicians.

Keywords: Trauma; Surgery; Psychological; Post-traumatic stress

Introduction

The physical consequences of Oral and Maxillofacial (OMF) trauma are well established. They often lead to scarring, deformity, and altered function such as visual disturbances and altered fields of view, speaking, and eating. The psychological consequences are challenging to identify and can go unseen in a busy clinic setting, particularly as surgeons focus their trained skills at the immediately visible or 'fixable' concerns. The concept of post-traumatic injury psychological aftercare is becoming increasingly understood, and service provision for this following major trauma more commonplace.[1,2] However, the impact of OMF trauma on patients' psychological health is still poorly understood and overlooked.

Affective disorders such as generalised anxiety, depression, acute stress reaction (ASR), and post-traumatic stress disorder (PTSD) are complex. Familiarity with the diagnostic features of common psychological presentations is important for clinicians to recognise. Referral of patients to mental health services and where appropriate signposting to self-referral services or online resources should be incorporated into everyday OMF outpatient practice. Core symptoms as outlined in ICD-10 are included in Table 1.

* Corresponding author.
E-mail addresses: Emma.walshaw@nhs.net (E.G Walshaw), Richard.taylor33@nhs.net (R. Taylor), j.anderson@hud.ac.uk (J. Anderson), Drpaulsexton@gmail.com (P. Sexton), Jiten.parmar@nhs.net (J.D Parmar), Lachlan.carter@nhs.net (L.M Carter).

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Table 1
Summarises ICD-10 core diagnostic features of anxiety, depression, acute stress reaction, and post-traumatic stress disorder.[3]

Condition	Core diagnostic features (ICD-10)
Anxiety (F41.1)	Persistent nervousness, trembling, muscular tensions, sweating, light-headedness, palpitations, dizziness, and epigastric discomfort.
Depression (F32.0)	Core symptoms: persistent (in excess of 2 weeks) Low mood, reduced energy, and decrease in activity, anhedonia, loss of interest, and concentration. Fatigue. Poor sleep, early morning waking. Additional common symptoms: reduced appetite, low self-esteem and self-confidence with feelings of guilt or worthlessness. Loss of libido. Suicidal thoughts, thoughts of self-harm. Depending on the number of symptoms and severity, can be classified as mild, moderate or severe.
Acute stress reaction (F43.0)	Typically, a mixed and changing picture including an initial state of 'daze' with some constriction of the field of consciousness and narrowing of attention, inability to comprehend stimuli, and disorientation. This may be followed by further withdrawal or agitation and over-activity. Autonomic signs of panic (tachycardia, sweating, flushing) are common. The symptoms usually appear within minutes of the stimulus and disappear within 2-3 days and resolve within 4 weeks. Amnesia may be present.
Post-traumatic stress disorder (F43.1)	Features include repeated reliving of the trauma in intrusive memories ('flashbacks'), dreams or nightmares, occurring against the persisting background of a sense of 'numbness' and emotional blunting, detachment from other people, unresponsiveness, anhedonia, and avoidance of activities and situations reminiscent of the trauma. There is usually a state of hypervigilance, an enhanced startle reaction, and insomnia. Anxiety and depression are commonly associated and suicidal ideation is common. Symptom duration is in excess of 4 weeks, often lasting years.

These affective psychiatric disorders can pose a significant mental health burden for individuals who may also be suffering considerable physical repercussions from their injuries. However, factors predicting these negative psychological outcomes for patients appear to be poorly understood by surgeons. In 2007, Zazzali et al surveyed 39 head and neck surgeons and found most admitted they felt patients' anxiety, depression, and substance abuse was not addressed adequately within their departments. They suggested a speciality mental health team within a hospital setting was the most appropriate place for patients to receive psychological support postoperatively, as opposed to within the surgical service.[3] Whilst this research demonstrates an awareness that psychiatric issues are a concern for clinicians postoperatively, the true scale of the issue and the ways in which OMF clinicians can best support their patients is not clear.

Previous systematic reviews exploring facial injury and psychological outcomes[4,5] have corroborated increased levels of anxiety, depression, acute stress reaction (ASR), post-traumatic stress disorder (PTSD), and substance misuse in those with facial injuries. However, these reviews were considerably limited in their time frames and exploration of the full scope of psychological sequelae of facial trauma.

Aims

The main aim of this scoping review was to establish the incidence of psychological sequelae following facial trauma.

A secondary aim was to establish which psychological screening tools are used by clinicians following facial injury and at which time points through a patients' recovery. Of particular interest are screening tools focussing on the risk of post-traumatic stress disorder (PTSD). Where reported, risk factors for developing negative psychological outcomes following facial trauma will be summarised.

Methods

Search strategy

Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) guidelines were followed in the reporting of this review. Three search engines were utilised – PubMed, MEDLINE and PsycINFO. Searches for relevant keywords and MeSH subheadings were completed on 24 May 2022. The search terms were "facial trauma" and "psychological", however these terms were expanded to achieve the most thorough results possible:

1. "facial trauma" OR "maxillofacial injuries" OR "facial injuries"
2. "psychological" OR "psychological trauma" OR "post-traumatic stress"

Study selection

Papers were considered if published between 1 January 2000 and 24 May 2022. Papers reporting psychological sequelae of facial injury were included. The following exclusion criteria were applied: full text was not available in English, conference abstracts, papers not related to facial injury or to the psychological impacts of trauma, articles focussing on facial burns, previous systematic reviews, or opinion pieces. Qualitative research was excluded, as were articles focussing on clinician understanding.

Literature search results were downloaded and independently reviewed by two authors (EW, RT). Articles were categorised and documented as 'included, excluded, or indeterminate'. Disagreements were escalated to senior authors (LC, JP). Hand-searching of a random 10% of included papers was completed by a single author (EW).

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After abstract screening, full article reviews and data extraction were undertaken independently by two authors (EW, RT). Critical appraisal was performed using Joanna Briggs institute toolkits.[6] Ethics approval was not required.

Results

Following removal of duplicates, 211 papers were retrieved from initial searches. A further three articles were identified by grey searching. 174 articles were excluded, see Fig. 1 for the PRISMA flow diagram. A total of 40 articles were included. These articles were sub-categorised to enable thorough analysis of key emerging themes of interest. These subcategories included: children and young adults (2), cross sectional studies (15), longitudinal studies (21) and interventional studies (2).

Articles were published from eight countries (Table 2). The majority were published by the USA or UK, often by the same research teams. There were no particular trends in the volume of articles published through time (Fig. 2), apart from an appreciable number (n = 6) published in 2018.

Table 2
List of countries and the number of publications from each country.

Country of publication	Number of publications
USA	12
UK	13
India	9
Nigeria	2
Iran	1
Australia	1
Croatia	1
Italy	1

This review identified 51 different questionnaires used focusing on psychological outcomes, summarised in Table 3. The most frequently utilised questionnaire was the Hospital

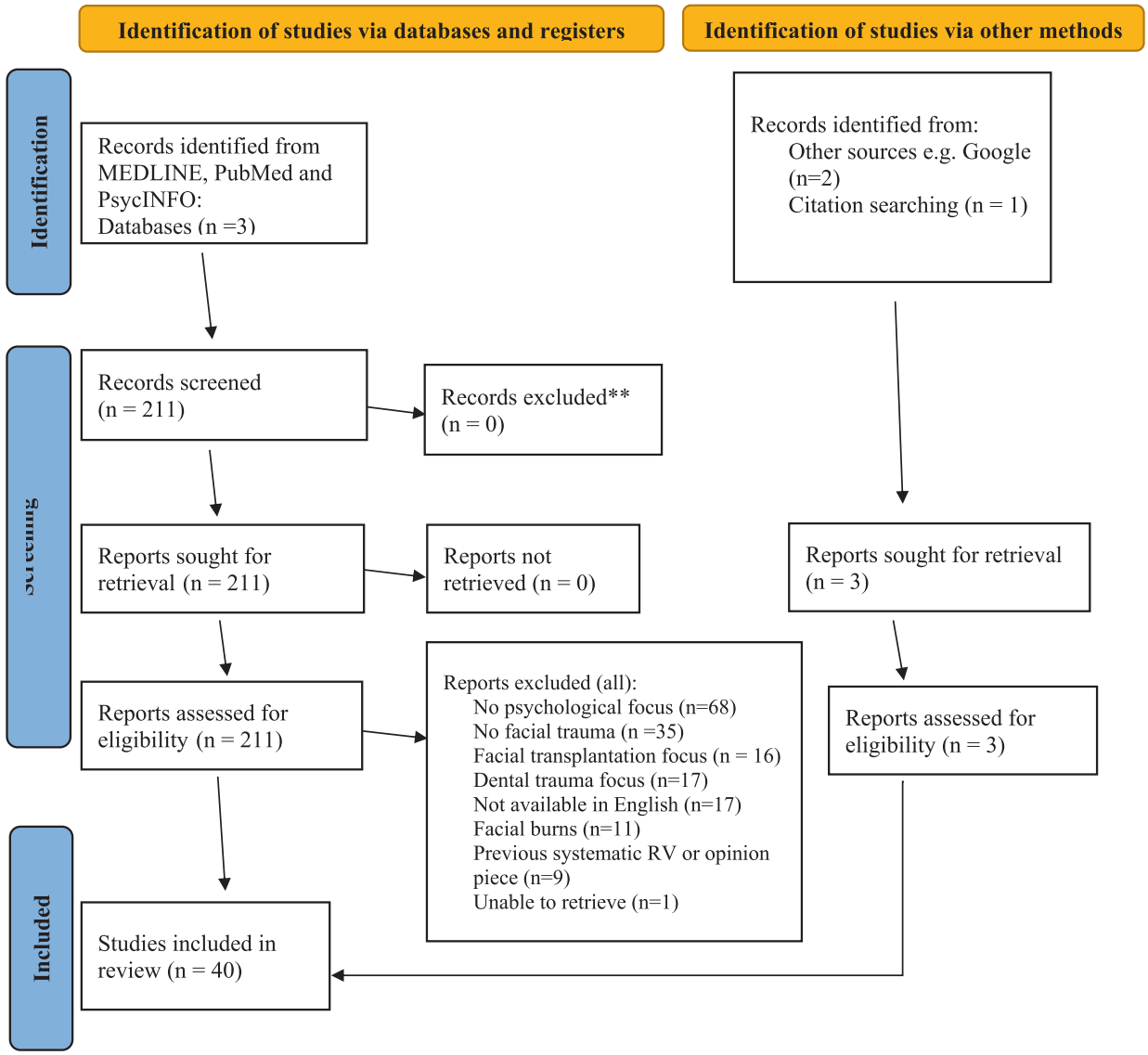

Fig. 1. PRISMA diagram demonstrating the screening and exclusion process of articles in this scoping review.

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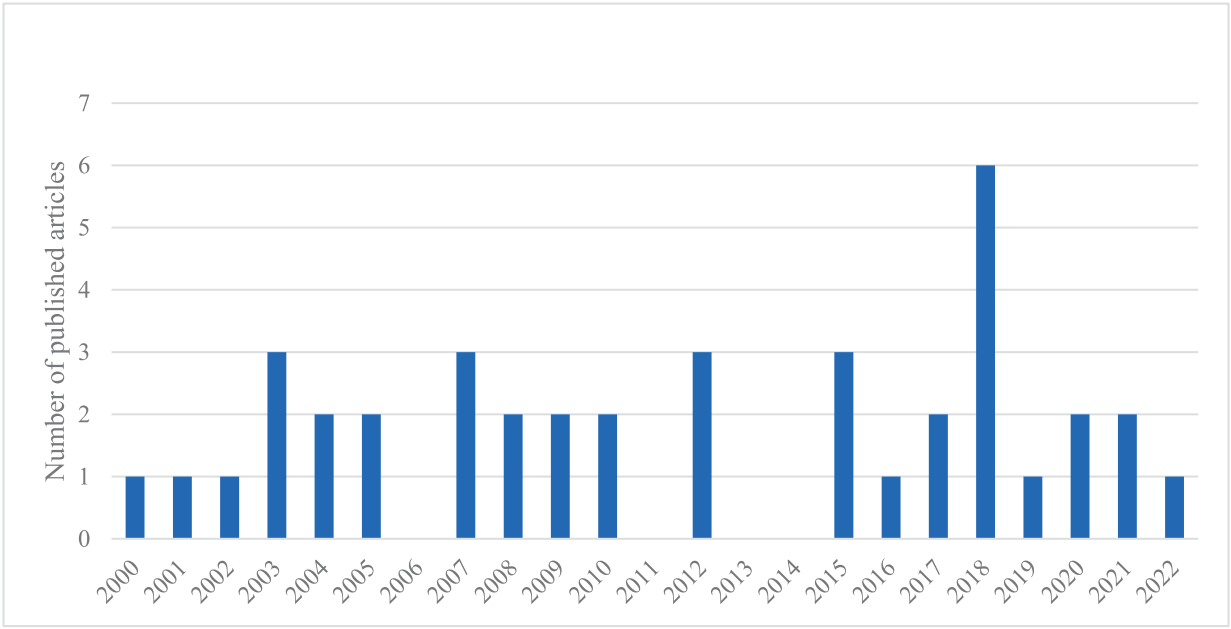

Fig. 2. Demonstrates the number of articles published within this review between 2000-2022.

Anxiety and Depression Scale (HADS) (n = 13), followed by study specific interviews (n = 5) and questionnaires (n = 5). There were eight questionnaires specific to PTSD (CAPS, DTS, IES-R, PDS, PC-PTSD, PCL-S, PTSD-symptom scale and TSQ), and six focused to alcohol misuse and reliance (AUDIT, APQ, CAGE, RAPS4, RCQ and ADD-SF).

Table 4 demonstrates a summary of all included articles, including critical appraisal scores and comments as per the Joanne Briggs Institute critical appraisal checklists.[6] Table 5 summarises the raw data findings from included articles.

Children and young adults

Two papers focused on the impact of facial trauma on children or young adults. These studies reported psychological health outcomes following traumatic injury, including altered interactions with others, substance abuse and PTSD symptoms. Rusch (2000) performed a prospective cohort study and found within five days of their injuries 98% of children were symptomatic for PTSD (most notably with exaggerated startles and avoidance behaviours), this number decreased over the following 12 months to 44%. One year after injury, a third of patients suffered flashbacks to their trauma and avoidance behaviours.[7] Murphy (2010) demonstrated injuries inflicted intentionally, such as alleged assault, were associated with significantly higher mean depression scores ($p = 0.030$) and higher AUDIT scores than those with unintentional injuries.[8] Thirty percent of young adults identified they had been drinking alcohol when their injury was sustained.[8]

Neither paper followed up psychological repercussions beyond 12 months post-injury and into adulthood. These outcomes would be of significant interest, particularly considering whether disfiguring or scarring injuries are associated with longer term negative psychological outcomes and impact on future life prospects.

Adults – cross sectional articles

Sixteen studies reported cross-sectional psychological outcomes for facial trauma patients. These papers used a wide range of screening tools at different time points, making comparison challenging. Multiple papers demonstrated a high rate of alcohol misuse related to sustaining facial injury (range 36.2% - 68%).[9–11]

An overwhelming finding from these cross-sectional studies was that facial trauma is associated with high rates of psychopathology, particularly post-injury anxiety and depression. Many studies found higher levels of psychiatric pathology when compared to controls,[10,12,13] in particular when there was significant resultant facial disfigurement.[13]

Two papers reported current practice within their unit regarding onward referral to psychiatric support services following OMF trauma.[14,15] Both papers were published from United Kingdom services and demonstrated a wide range in the chosen support services utilised, including GP referrals, inpatient psychiatric liaison and direct local mental health service referrals.

All but one paper chose a time frame within 1 year of the traumatic incidence. Levine (2005) recorded patient outcomes up to two years post-injury, however no comment was made about how this time frame was chosen.[10]

Adults – longitudinal articles

Twenty-one articles with longitudinal study designs were included in this review. In general, these studies found that the psychological impact of OMF trauma reduced with time

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Table 3
List of psychiatric questionnaires utilised by studies to screen and assess for psychiatric disorders.

Questionnaire utilised	Number of articles
Hospital Anxiety and Depression Scale (HADS)	13
Study specific interview	5
Study specific questionnaire	5
Alcohol Use Disorders Identification Test (AUDIT)	4
CAGE questionnaire	4
Impact of Event Scale (IES-R)	4
Trauma Screening Questionnaire (TSQ)	4
Personal Health Questionnaire Depression Scale (PHQ-9)	3
Brief Symptom Inventory (BSI)	3
Derriford Appearance Scale 24 (DAS 24)	3
Service Use and Adjustment Problem Screen (SUAPS)	3
PTSD Checklist (PCL-S)	2
Acute Stress Disorder Scale (ASRS)	2
Clinician Administered PTSD scale (CAPS)	2
Davidson Trauma Scale (DTS)	2
Injury Severity Score (ISS)	2
Mini International Neuropsychiatric Interview (MINI)	2
Post-Traumatic Stress Diagnostic Scale (PDS)	2
Rapid Alcohol Problems Screen 4 (RAPS4)	2
Rosenberg Self-Esteem Scale	2
Short Form 36 (SF36)	2
Zung's self-rated depression scale	2
Spielberger's State-Trait Anxiety Inventory (STAI)	2
Personal Health Questionnaire Depression Scale (PHQ-8)	1
Social Readjustment Rating Scale (SRRS)	1
Alcohol Problems Questionnaire (APQ)	1
Body Image Automatic Thought Questionnaire (BIATQ)	1
Centre for Epidemiologic Studies-Depressed Mood Scale (CES-D)	1
Coping Orientation to Problems Experienced (COPE)	1
Disfigurement Scale (head and neck cancer)	1
Situational Inventory of Body-Image Dysphoria (SIBID)	1
EuroQol-5D (EQ-5D)	1
Generalised Anxiety Disorder Assessment (GAD-7)	1
General Health Questionnaire (GHQ-12)	1
General Health Questionnaire (GHQ-28)	1
General Health Questionnaire (GHQ-30)	1
Impact Message Inventory (IMI)	1
Life Events Checklist (LEC)	1
Marlowe-Crown Social Desirability Scale (MC SDS)	1
Mental Health Inventory 5 (MHI-5)	1
Multidimensional Body-Self Relations Questionnaire (MBSRQ)	1
National Eye Institute 25-item Visual Function Questionnaire (NEI VFQ-25)	1
Oral Health Impact Profile 14 (OHIP-14)	1
Primary care PTSD screen (PC-PTSD)	1
PTSD-Symptom Scale	1
Readiness to Change Questionnaires (RCQ)	1
Satisfaction with appearance scale	1
Satisfaction with life scale	1
Short form Alcohol dependence data (ADD-SF)	1
University of Washington Quality of Life Questionnaire (UW-QOL)	1
Social Satisfaction Questionnaire (SSQ)	1

but never appeared to reduce to an incidence of zero. As no studies had pre-trauma psychological scores, it is not possible to determine whether psychological diagnoses ever regress to pre-injury levels.

Some studies demonstrated fluctuating incidence of psychological scores through time, in particular anxiety which showed increased incidence with time[16–18] and PTSD.[18] To consider the significance of this or whether further increase in diagnosis through time would have occurred would require longer follow up periods. Unfortunately, none of the included studies looked at follow up times greater than 12 months, so the progression of these sequelae was not reported. Considering the well-established pathology of PTSD, it may be many years after the event or injury that an individual first encounters symptoms of PTSD.[19]

Interventional studies

Two studies were interventional in nature. Both studies involved mental health support either in or following an

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Table 4
Summary of included articles within this structured review. *Joanna Briggs Institute score for critical appraisal.

First author, year, reference	Participants	Key findings	Timing of questionnaires	Psychological tools utilised	JBI % score*	Critical appraisal comments
CHILDREN AND YOUNG ADULTS						
Murphy, 2010[8]	67 adolescents (14-20 years) with orofacial trauma.	30% of participants had been drinking alcohol at the time of injury. 59% had experienced multiple types of injuries in the preceding 6 months (mean 2.4, SD 2.0). Males were more likely to suffer facial injuries than females ($p = 0.060$).	>12 months	1. AUDIT	68.75	Open description of recruited participants, but minimal description of recruitment methods with possible bias resulting. Raw incidence data is not available for further analysis.
		Those with intentional injuries had higher depression scores than those with unintentional injuries ($p = 0.030$). Paranoia and somatisation were also higher in these groups ($p = 0.049$, $p = 0.026$), and the likelihood of family members suffering with alcohol problems ($p = 0.018$).		2. BSI		
	Two level 1 trauma centres in USA between July 2006 – March 2008					
Rusch, 2000[7]	57 children (3-12 years old).	At baseline, all but one child exhibited psychological symptoms following their injury. At 1 year follow-up, 44% showed 2 or more psychological symptoms directly related to their trauma. Females were more likely to suffer from flashbacks at 1 month ($p = 0.018$), but no other age or gender significant differences were identified. Females showed less symptom frequency at 1 year. Injury severity did not predict PTSD development.	<4 days 1 month 3 months 6 months 12 months	1. Semi structured interviews 2. Study specific questions	68.75	Method of participant recruitment not transparent. Methods of determining symptoms e.g. 'flashbacks'/ 'irritability' are subjective. Small sample size.
	Recruited from a Reconstructive Surgery department in USA.					
LONGITUDINAL STUDIES						
Baecher, 2018[32]	1062 patients.	Traumatic injuries (of which head, face and neck accounted for 47.7%) are associated with PTSD, anxiety, and depression. Females suffered these psychiatric sequelae more than males ($p < 0.001$), as did younger patients ($p < 0.001$). Patients who suffered injuries to the head and face had significant PTSD symptoms when compared with other body injuries ($p < 0.001$).	Baseline 3 months 12 months	1. MINI 2. CAPS 3. HADS	100	>24 hours admission needed increasing risk of selection bias in the sample as less severe injuries may be missed. Large randomly selected sample, 91% completion rate.
	Recruited via trauma hospitals, Australia. March 2004 – February 2006.					

Braimah, 2018[27]	80 OMF and 80 orthopaedic patients.	Subjects with maxillofacial fracture had significantly lower self-esteem compared to subjects with long bone fracture at 1 week, 6 week and 12 week intervals $p < 0.05$.	Baseline	1. Rosenberg Self-Esteem Scale	67	Excluded those with combined long bone + maxillofacial injuries.
	Nigerian Hospital between February 2012-January 2013.	Patients suffer lower self-esteem within the first 6-8 weeks after their injury, particularly those patients suffering facial injuries when compared with long bone injuries ($p < 0.001$).	6 weeks			Excluded <GCS 12 - more OMFS injuries are associated with low GCS which will introduce bias in the results.
			12 weeks			
Glynn, 2003[36]	3 articles containing 1 patient cohort: 336 patients with at least 1 mandible fracture.	25% reported experiencing symptoms consistent with acute PTSD at 1 month. Older individuals and females had worse psychiatric outcomes following their orofacial trauma.	10 days	1. PDS scale	89	Patients with gunshot injuries or altered mental status due to injury were excluded. Unclear whether patients with additional facial fractures (zygomatico- orbital) were included and their effect as confounders was not accounted for.
Glynn, 2007[37]		Previous trauma exposure, high rates of stressful life events in 1 year prior to the trauma and high rates of pain at discharge/admission were also related to higher PTSD symptoms at 1 month.		2. CAGE		<15% drop out rate at 1 month.
Lui, 2009[38]	Recruited from 1 Hospital in USA between July 1996 – December 2000.	Unmet social service need and need for more instrumental and emotional support were independent predictors of 12-month PTSD outcomes.		3. SRRS		
			1 month	4. SF-36		
			6 months	5. MHI-5		
			12 months	6. SUAPS		
Hu, 2022[40]	241 patients following facial/ dental injuries.	Patients who clinicians considered to have disfiguring facial injuries had worse psychological scores according to the IES-R scale compared with non-disfiguring injuries.	Baseline (day of discharge)	1. IES-R	67	IES-R scores reported in full and categorised into subgroups for reader clarity. Confounding factors not addressed in full within article.
		Females, those between 18-40 years old and those needing maxillomandibular fixation had worse scores overall.	1 month			
	1 Hospital in India.		6 months			
Hull, 2003[16]	39 patients following OMF trauma.	54% showed post-traumatic psychological symptoms at initial screening, with 41% meeting diagnostic PTSD criteria at week 4-6 post injury.	<10 days	1. Interview	81	Small sample (24 completing follow-up questionnaire). Those with loss of consciousness exceeding 15 minutes were excluded (more likely in severe injury), this was not addressed.
	Recruited via 1 Hospital in Scotland, September 2000 – March 2001.	Patients with a history of psychological distress, fear of the unknown and females had poorer outcomes overall.		2. GHQ-28		
				3. HADS		
				4. IES-R		
				5. DTS		
			4-6 weeks	6. EQ-5D		

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Kishore, 2020[28]	50 patients with OMF trauma recruited to multiple outpatient and emergency departments in India.	84% of patients had psychological stress within 1 week of their OMF injury, which reduced to 24% at 1 month and 22% at 6 months. HADS and TSQ scores were significantly reduced between follow-up visits. Patients with soft tissue injuries had less anxiety and stress compared to fractures (p = 0.003).	1 week 1 month 6 months	1. HADS 2. TSQ	67	Excludes patients with the most severe injuries and does not identify confounders. Data are divided into 3 age groups, but sample disproportionately younger (only 14% > 45 years).
Krishnan, 2018[17]	48 patients with at least one facial fracture. Recruited from an Indian Hospital between January 2013 – March 2014.	At 14 weeks postoperatively, 5 patients satisfied criteria for a diagnosis of PTSD following their injuries. None of the results can be considered statistically significant when the standard alpha value of 0.05 is applied. The paper reports significance for alpha values <0.5 and therefore results should be interpreted with caution.	<2 weeks 4-6 weeks 12-14 weeks	1. GHQ-12 2. HADS 3. TSQ	50	Authors used an arbitrary alpha value (p = 0.5) therefore conclusions of statistical significance should be interpreted with caution. Poor quality statistical analysis.
Lento, 2004[47]	336 patients with mandible fractures and 119 control oral surgery patients. Recruited between August 1996 – May 2001 in USA.	Trauma patients were more likely to suffer with psychological distress than a control group. Depression, anxiety, phobic anxiety and obsessive-compulsive tendencies were seen significantly more frequently in those patients who had suffered OMF trauma, particularly in the 10 days to 6 months post-injury timeframe.	<10 days 1 month 6 months 1 year	1. Study specific interview 2. CAGE 3. SUAPS 4. BSI	80	Mandible fracture required so excludes other common OMFS injuries. Unmatched control group (much younger). Not clear how this comparative confounder was addressed.
McMinn, 2018[49]	230 patients admitted for >24 hours. Recruited from US trauma centre, March 2012 – April 2014.	15.2% (n = 35) of the sample had craniofacial injuries. Patients with craniofacial injuries had significantly lower income, higher injury severity scores and were admitted to ICU more frequently (p < 0.05) than those with non-craniofacial injuries. Patients with craniofacial injuries had significantly higher alcohol use than non-craniofacial injuries (p = 0.049) and higher pain levels (p = 0.008).	Baseline (during hospitalisation) 12 months	1. ISS 2. PHQ-8 3. PC-PTSD 4. AUDIT	90	Craniofacial injury vs control groups were well defined and matched. Confounding factors identified but unclear strategies used to deal with them. 12-month follow up mirrors similar studies.
Prashanth, 2015a[42]	2 articles containing 1 cohort: 264 patients with OMF trauma.	Facially disfiguring injuries are associated with higher IES, anxiety and depression scores than non-disfiguring injuries. Females and patients <50 years all had higher PTSD levels.	Date of discharge	1. IES (only in 2015b)	2015a 65	Inclusion criteria, in particular the definitions of disfiguring and non-disfiguring were not clear, resulting in probable bias in results. No confounders were identified between the orthopaedic vs facial injury groups e.g. mechanism, which is likely to contribute to outcomes.
Prashanth, 2015b[43]	Multiple trauma centres in India.	This paper excluded injuries <3 cm in length arbitrarily without evidence to support this as the threshold to consider an injury disfiguring.	1 month 6 months	2. HADS (only in paper 2015a)	2015b 56	

Rahtz, 2017[33]	109 patients with facial injuries and control group of 84 with other injuries. Recruited in a UK Hospital, July 2012 – April 2014.	At baseline, significantly more patients were concerned about their appearance if they had facial injuries rather than non-facial injuries ($p < 0.05$), however this was not true at 8 months post-injury. Appearance concern was strongly associated with psychological distress, at baseline and 8 months. Women, younger patients and those with higher baseline acute stress/depression/anxiety scores were associated with higher DAS-24 scores overall, regardless of injury location. Facial injuries were not more likely to be associated with psychological distress than non-facial injury statistically.	<21 days 8 months	1. DAS-24 2. ASRS 3. PCL-S 4. HADS 5. Disfigurement Scale	83	Used a non-validated disfigurement scale (only validated for use in cancer, not trauma). Results should be interpreted considering this. Consecutive recruitment methodology and thorough reporting of statistics.
Ranganathan 2018[48]	88 patients with OMF trauma injuries. Recruited from 1 centre in India. Time frame not reported.	Compares 3 groups of OMFS injuries; cosmetic defects vs functional defects vs both. In the immediate post-trauma stage, all patients with 'cosmetic defects' showed severe depression; the percentages of patients with severe depression in 'functional defect' and 'both' were 8.8 and 81.4%, respectively, which was statistically relevant. Depression decreased gradually in the postsurgical phase. Patients with cosmetic defects consistently recorded higher depression scores at all intervals. The time taken for recovery from depression was shorter for patients with only functional deficits.	Immediate Post operative 1 day 14 days 1 month	1. Zungs self-rated depression scale	62.5	Consecutive recruitment methodology although unclear regarding time frame as this is not reported. Comparison between the 3 groups should consider that the groups were significantly different in size (11, 34, 43). Results should be interpreted with caution.
Roccia, 2005[34]	50 patients following OMF trauma. Recruited from 1 Hospital in Italy between January – September 2003.	At the time of the trauma, 44% of patients met criteria for PTSD, however by 3-months postoperatively this number had reduced to 26%. Being female or being unmarried was strongly correlated ($p < 0.05$) with higher PTSD susceptibility. Level of education, occupation, age and aetiology of trauma did not significantly correlate with psychiatric welfare following the incident.	<48 hours 3 months	1. DTS 2. STAI 3. Zung's self-rating depression scale	87.5	Consecutive recruitment of participants and thorough reporting of statistical analysis. Unclear evidence regarding accounting for confounding factors.

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Sen, 2001[39]	147 patients admitted for surgery following OMF fractures. Recruited from 1 unit in UK, January – August 1997.	>30% of patients were depressed or anxious at either time point during this study; anxiety declined through time however depression increased. Males reported improved anxiety levels in comparison to females ($p = 0.009$). 31% recall rate at 1-year post injury. All domains of questionnaires showed improvement at 1 year compared to pre-treatment, apart from employment levels.	Pre-operative 1 year	1. HADS 2. UW-QOL 3. Study specific questionnaire	77.8	Postal survey methodology with associated response bias. Large attrition rate. High proportion of males (91%) with no indication whether this represents the patient population in the department.
Shetty, 2003[35]	336 patients with mandible fractures, and 119 controls (elective oral surgery). Recruited from 1 USA Hospital, August 1996 – December 2001.	Patients with OMF trauma are more likely to report habitual alcohol use when compared to controls (31.3% reporting positively to CAGE questionnaire). OMF trauma patients had higher depression, anxiety and hostility scores than the matched control group. Women, older patients (>40), those with previous trauma or high pain levels post injury are more likely to suffer with PTSD or negative psychological sequelae following trauma.	<10 days 1 month 6 months 1 year	1. BSI 2. PDS 3. SUAPS 4. CAGE	83.3	Control group well matched to the mandible fracture cohort. High attrition rate (loss of 57%) up to 1 year. Analysis of those patients not keeping appointments reported to report recall bias risk. Statistical analysis transparent.
Tebble, 2004[29]	63 patients with facial lacerations (>1.5 cm in length) Recruited from an A+E department in UK in 2001.	Facial scar size, living arrangements and aetiology of injury also significantly negatively impacted self-consciousness at 1 week and 6 months post injury. The larger the scar (in particular >4 cm) had worse general and social self-consciousness scores. There was no significant relationship between scar, self-consciousness and anxiety through time.	1 week 6 months	1. DAS-24 2. STAI	66.7	Removal of older adults from the sample with recruitment bias associated. Small sample size with low recruitment rate, attributed by authors to high treatment dissatisfaction rates.
Ukpong, 2007[18]	65 patients with traumatic facial injuries. Recruited from a hospital in Nigeria. August 2004 – October 2005.	Anxiety and depression scores reduced over time following injury (anxiety 11.8% to 3%, depression 41.2% to 21.7%). PTSD was diagnosed in 5 patients – 1 met the criteria at 6-8 weeks post injury and a further 4 met criteria at 10-12 weeks post injury.	<10 days 6-8 weeks 10-12 weeks	1. HADS 2. TSQ 3. GHQ-30	66.7	Consecutive recruitment methodology. Relatively small sample size with a high attrition rate throughout follow-up (54.9% lost at week 10-12).
Wilson, 2018[31]	150 patients following OMF trauma. Recruited via UK trauma hospital, January 2012 – March 2013.	51% of patients obtained their injury from alleged assault or physical attack. 44% of patients had been under the influence of alcohol at the time. There were significant associations between the level of perceived distress at the time of injury and depression at 3 months ($p < 0.005$) and the number of traumatic life events prior to facial injury and depression at 3 months ($p < 0.005$).	1-3 months 6-9 months	1. LEC 2. MINI 3. DAS-24 4. Study specific questions	77.8	Confounding factors identified and accounted for. Recruitment bias associated with low female participation (16%). Results and statistical analysis are transparent and thorough.
CROSS SECTIONAL STUDIES						

Auerbach 2008[9]	47 patients with OMF injuries requiring emergency surgical intervention. Recruited from a single centre, USA.	Patients who perceived their doctor to be controlling or had emotion focussed coping strategies had higher ASRS scores. ASRS scores were unrelated to the severity of patients' injury and to their level of alcoholism. 36.2% of the patients had scores on the Alcohol Use Disorders Identification Test indicative of 'hazardous and harmful alcohol use, as well as possible alcohol dependence'.	10-12 days	1. ASRS 2. Satisfaction with appearance scale 3. COPE 4. IMI 5. ISS 6. AUDIT	93.7	Confounding factors identified but minimal information regarding how they were accounted for. No raw incidence data reported.
Chandra, 2008[52]	25 patients with facial injuries (incl. mandible fracture) and 35 healthcare providers (20 OMFS, 15 ENT). Level I trauma hospital in USA.	Patients are interested in receiving postoperative care for psychological problems following their traumatic injuries, however felt information about services, finances and availability of transport were barriers to receiving care. Health care providers' concerns mirrored those of patients. 48% of patients screened positively for all three disorders: depression, PTSD and alcohol problems. 56% indicated that the injury impacted their relationship with family and friends.	1 month	1. Study specific 2. PTSD Checklist 3. PHQ 9 4. RAPS-4	81.5	Well defined sample, with good description of subjects and setting. Confounding factors accounted for in part, however large confounders such as alcohol intake were not considered. Small sample size.
Gandjalikhan-Nassab, 201512	50 patients with facial trauma in Iran between 2012-2013. Control group (50, dentoalveolar treatment). Iran.	The results showed that patients with maxillofacial trauma had higher rates of depression and anxiety, with significant differences between this group and controls (P = 0.01). Females and those who were unemployed had significantly higher rates of depression. Those with a history of antidepressant medication use and/or a previous psychological diagnosis also had higher depression rates.	>12 months	1. HADS 2. OHIP 14	62.5	Recruitment methods partially explained, as well as inclusion/exclusion criteria. Raw incidence scores reported in full. Limited appreciation for confounding factors.
Howson, 2021[14]	199 adult patients following OMF trauma attending an outpatient clinic. Trauma hospital, UK. Recruited July 2015 – November 2017.	24% of patients screened positive for PTSD. Of these (48) patients, 4 had PTSD alone, 3 PTSD + Depression, 17 for anxiety + PTSD and 24 positive for PTSD, Anxiety and Depression. 90% of patients were referred to see their GP regarding the symptoms, whilst a further 2% were referred directly to local community mental health services. Clinicians were surveyed in their use of psychological screening in clinics, 54% reported they would not have screened patients. Reasons for this included lack of awareness and under confidence in directing patient care once identified.	<4 weeks (83%), >4 weeks (17%)	1. TSQ 2. PHQ-9 3. GAD-7	87.5	Transparency in reporting demographics, raw incidence of disease. Confounding factors, such as direct attribution of psychological disease to trauma, were identified however unable to be accounted for in the results.

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Islam 2009[15]	300 patients with OMF injuries. 1 hospital in Australia between April 2006 – January 2008.	Retrospective cases reviewed for evidence of liaison psych input during patients' in-patient hospital stay following OMF injuries. 16 of the 300 were referred to liaison psychiatry services during their hospital stay, 10 of whom were referred for substance abuse concerns.	Not specified	n/a	87.5	Consecutive recruitment. Retrospective in nature and so limitations regarding missing data. Premorbid diagnosis identification reliant on record keeping and communication between health services.
Islam 2010[13]	50 OMF trauma patients, compared to controls (50, undergoing elective OMFS procedures). Recruited from 1 UK Hospital, June 2008 – August 2008.	Mean depression scores were significantly higher in the facial trauma group compared to controls ($p = 0.006$). Anxiety scores were higher but did not reach statistical significance ($p = 0.07$). Variables with significant associations ($p < 0.05$) with high depression scores in the facial trauma group were females, presence of a permanent facial scar, and past psychiatric history. There was significant correlation between self-perception of facial disfigurement and scores obtained in anxiety subscale ($r = 0.41$, $p = 0.003$) and depression subscale ($r = 0.46$, $p = 0.001$).	3.5 weeks (mean)	1. HADS	87.5	Matched control group utilised and comparison between groups covered in detail. Confounding factors discussed and methodology limitations highlighted.
Islam 2012a[44]	102 patients with OMF injuries. Multinational comparative study. Recruited June – September 2008.	Anxiety and depression in facial trauma victims were comparable in both countries (UK and Australia). There were no statistically significant differences between the two cohorts in any domain of the HADS scale.	UK: 3.5 week (mean) Australian: 3.8 weeks (mean)	1. HADS	87.5	Confounding factors discussed in detail, and limitations of the study methodology highlighted. Transparent and comprehensive statistical analysis.
Islam 2012b[45]	2 articles from 1 patient cohort: 102 patients with OMF trauma; 71 treated operatively and 31 treated non-operatively.	Psychometric scores suggestive of anxiety and the depressive state were significantly greater in the 'blame-others' group than in the 'self-blame' group. The incidence of psychomorbidity in the blame-others group was approximately twice that found in the self-blame group (odds ratio 2.2). Facial trauma patients who blamed others for their injury were predominantly younger men ($p = 0.01$) and typically victims of intentional trauma ($p < .001$).	3.8 weeks (mean, blame others group)	1. HADS	2012b	Recruitment of patients is not clear and so there is risk of sampling bias.
Islam 2012c[46]		HADS anxiety subscale score for operatively managed patients was significantly higher when compared with the non-operatively group. Operative intervention did not significantly affect the rates of depression. No statistically significant differences between the mean HADS subscale scores of those patients who sustained a facial soft tissue injury ($n = 16$) compared with hard tissue ($n = 86$).			75	Clear statistical analysis with demonstration of raw HADS scores shown. Some confounding factors (such as premorbid psychiatric diagnosis) not accounted for.
	Recruited prospectively from 2 Hospitals in UK between June – August 2008.		4.2 weeks (mean, blame self group)		2012c 87.5	

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Levine, 2005[10]	20 adults with facial laceration >3 cm or fracture requiring intervention. Compared to control group. Retrospective analysis of cases between May 1997 – December 1998. USA.	Compared to the control group, OMF injured patients had significantly lower life satisfaction, more negative perceptions of body image and higher PTSD, alcoholism and depression incidence. Postoperatively, patients also demonstrated higher unemployment, marital problems, binge drinking (CAGE scores), jail time and lower attractiveness scores. There was no significant difference between the control group and study population for PTSD symptoms.	6 months - 2 years	1. Satisfaction with life scale 2. Rosenberg Self-Esteem Scale 3. MBSRQ 4. SIBID 5. CAGE 6. BIATQ 7. CES-D 8. PTSD symptom scale 9. MC SDS	62.5	Authors used an arbitrary alpha value which is not typically accepted as significant ($p = 0.052$). Therefore, conclusions of statistical significance should be interpreted with caution. Very low participation rate (18.5%, n = 20) and risk of response bias is high.
Lupi-Fernandin, 2020[41]	42 patients with maxillary/ zygomatic fractures compared to controls. Postal survey, Croatia between January 2003 – December 2013.	In general, quality of life was similar between post-operative patients and the control group. However, younger patients had significantly reduced emotional well-being ($p = 0.03$), and older patients had severely impacted physical function ($p = 0.049$) when compared with their counterparts. The type of midface fracture and severity did not impact health related quality of life in any significant way.	<1 year	1. SF-36	62.5	Confounding factors (e.g. mechanism of injury) not accounted for. Inclusion/exclusion criteria are also unclear, as some isolated fractures were excluded without reason. Poorly representative sample as no females were included.
Nayak 2019[25],	2 articles, 1 cohort: 147 patients admitted with OMF injuries (2021), 104 patients (2019).	28.6% patients were diagnosed with PTSD following their OMF trauma, most of whom suffered orbital complex fractures ($p < 0.01$). Perceptible scars and avulsed/luxated anterior teeth were also associated with increased rates of PTSD ($p < 0.01$).	1-3 months	1. IES-R	81.5	Excluded some key groups of interest including those with orthopaedic fractures and those with previous psychological history. The bias associated with this is not reported by authors.
Nayak, 2021[26]	August 2017 – February 2018. 1 Hospital in India.	PTSD was most persistent in ZMC fractures compared to all other fractures ($p < 0.05$). If patients had both aesthetic and functional deformity following traumatic injury, they were more likely to suffer PTSD, particularly between the 1st-3rd month.		2. CAPS-5 3. PCL-S		Large sample size compared to equivalent research.

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Sharma 2017[53]	100 patients with orbito-facial trauma (blow out, le Fort II and III fractures). Single OMF unit in India. Time frame not specified.	49% of patients had NEI VFQ-25 scores <25, considered very low quality of life score by the authors. Patients who suffered with visual problems, reduced ability with daily activities and general health decline had significantly worse quality of life scores ($p < 0.01$) than those who didn't. Only 16% of patients chose to seek psychiatric help, with most stating 'lack of awareness' for a reason to not seek psychiatric help.	6 months	1. NEI VFQ-25	100	Population inclusion criteria and resultant demographics well described. NEI VFQ-25 valid and results described. Confounding factors discussed and accounted for. Consecutive recruitment methods.
Wong, 2007[11]	25 patients 1 month post-facial injury. Recruitment from an OMFS outpatient clinic in USA between January – November 2005.	68% of patients met diagnostic criteria for probable alcohol misuse disorder (AUD), 72% met the criteria for PTSD and 76% for major depression. Almost half of participants (48%) had 'great interest' in psychological aftercare. Only 2 patients had been receiving psychological support or had known mental disorders prior to their facial injury.	1 month	1. Study specific interview 2. Study specific questionnaire 3. PTSD symptom checklist 4. PHQ-9 5. RAPS4	100	Transparent population and raw incidence findings. Confounding factors reported. Small sample size within a short time period following trauma. Single site results with associated bias highlighted by authors.
INTERVENTIONAL STUDIES						
Choudhury-Peters, 2016[21]	642 patients attending trauma clinic following facial trauma. OMF outpatient department, UK. January 2012 – March 2013.	Initial screening for PTSD/mental health disorders completed at OMF outpatient clinic, and intervention from clinical psychologists either immediately or within a few days. 78% of patients who received psychological intervention said it improved with experience of attending the OMF trauma clinic. Patients found the interventions to be 'relevant', 'flexible', 'rapid' and felt their recovery would have been significantly worse without it.	1-3 months 6-9 months	1. Study specific (incorporating HADS)	66.7	No control group, and as such interpretation of results should be considered within this context. Multiple points of follow-up used for analysis, some with broad time frames which may reduce the nuances of the data received.
Smith, 2002[20]	151 patients with facial injury. Emergency Departments in Welsh hospitals, January 1997 – July 1998.	Randomised controlled trial with the intervention of a one-session brief motivational interview by a nurse, versus a normal package of care. Patients showed a significant decrease in 84-day total alcohol consumption over 12 months ($p < 0.006$), and significant reduction in hazardous drinkers were found in the motivational intervention group ($p < 0.009$).	5-7 days 3 months 1 year	1. AUDIT 2. APQ 3. RCQ 4. ADD-SF 5. SSQ 6. 90I Drink diary section	69.2	True randomisation of participant treatments, however unable to blind groups and clinicians considered the method of intervention. Groups were similarly matched. Excluded key groups of interest including the homeless population.

OMF trauma clinic follow-up appointment. Smith (2002) found significant improvements in hazardous consumption of alcohol in the group who received a motivational interview ($p < 0.009$) in comparison to a control group receiving the normal package of care.[20] Choudhury-Peters et al found 78% of patients who received a psychologist follow-up after the OMS trauma clinic appointment found them to be at risk during mental health screening, found it helpful and improved their overall postoperative experience.[21]

Discussion

This structured review has identified several key themes of interest. There is currently no standardised practice for psychological screening of OMF trauma patients following their trauma or surgical intervention. Additionally, studies do not clearly define their diagnostic criteria for common psychological presentations or whether these are consistent with the ICD-10 definitions.[3] This makes results comparison challenging and meta-analysis impossible. A standardised screening tool would be desirable to reliably assess the incidence of negative psychological symptoms post injury and guide clinicians in ensuring that patients from different geographical locations have the same opportunities to access referral for psychiatric support. Despite general acceptance that integrated treatment pathways to address psychological distress following trauma are necessary, such mechanisms are rare in the context of maxillofacial surgery follow-up pathways[14,21] which is contrary to national guidance in the United Kingdom.[22–24]

Prevalence

Whilst many studies did report raw prevalence scores from their study cohort questionnaires, the definitions of anxiety, depression, ASR and PTSD used were not transparent. Results of this review should be considered within this context and comparison between studies is not advised because of this. Confounding factors of assumed considerable significance, including patients with pre-existing psychiatric conditions or those with polytraumatic injuries were excluded within many studies.[25–31] This will have certainly biased prevalence of reported psychiatric conditions following trauma and may represent an underestimation in disease burden of psychopathology in the facially injured.

Screening patients

In the UK, the National Institute of Health and Care Excellence (NICE) guidelines for the assessment and management of PTSD state that primary and secondary care providers should establish the local protocols involving 'the most appropriate' to manage these PTSD symptoms.[22–24] There is little evidence to suggest when this screening should occur in a patient's journey. It may be most feasible for the OMF surgeon prior to discharge from hospital or at the first outpatient clinical visit (usually within six weeks), however this excludes patients who do not require an inpatient hospital stay or do not attend follow up, on whom the psychiatric impact of their injuries is significantly under-researched. Additionally, screening early in this post-injury phase may confuse ASR symptoms with PTSD symptoms and result in increased referral to specialist services for patients whose symptoms may naturally subside with the passage of time. Further longitudinal research with the primary aim of establishing the ideal time to screen for psychological symptoms is warranted, ideally evaluating core risk factors such as injury severity and mechanism as predictors of negative mental health outcomes. Identifying those at highest risk of negative outcomes may enable improved access to timely follow-up and appropriate specialist assessment.

Table 3 demonstrates the vast range of questionnaires utilised to screen for psychiatric outcomes in this patient cohort. The heterogeneity of the questionnaires used, differing content and the conflicting questionnaire objectives (diagnostic vs screening, patient reported vs clinician reported) makes detailed comparison and synthesis impossible. There were no questionnaires used specific to facial trauma injuries.

Risk factors for psychological distress

Various patient factors have been identified by this review that increase the risk of experiencing post-traumatic distress including being female,[16,32–40] increased age,[35–38,41] decreased age,[32,33,42,43] substance misuse (including alcohol),[17] previous history of psychiatric disorder,[16,33] previous traumatic incidents,[31,35–38] and postoperative pain or complications.[17] Whilst some of these are mutually exclusive, this scoping review reveals the huge range of factors making patients prone to psychological disturbance following a facial injury.

The impact of substance misuse prior to developing a traumatic facial injury is highlighted.[8,31] A history of alcohol misuse, being the most prevalently researched, is linked to an increase in the incidence of facial trauma. A history of alcohol misuse in family members was also shown to increase interpersonal assault injuries in children/adolescents.[8] One randomised controlled trial[20] highlighted that a singular motivational intervention with patients suffering from facial injury reduced total alcohol consumption over the following 12 months ($p < 0.006$) and led to a reduced number 'hazardous drinkers' in total when compared with patients who did not receive such an intervention ($p < 0.009$).

Whether particular OMF injury patterns significantly impacted psychological outcomes is mixed within the literature. Kishore found those with solely soft tissue injuries had less anxiety/stress post injury than those who suffered hard tissue fractures ($p = 0.003$),[28] whereas Nayak (2019, 2021) found those patients who suffered zygomatic complex fractures were more likely to suffer persistent PTSD symptoms than other fracture patterns.[25,26] In comparison, some research teams found psychiatric outcomes did not significantly vary depending on injury pattern.[41,44–46] Many studies excluded OMF injuries that were not bony in nature,[17,47] and as such appropriate comparison between injury patterns is not easily feasible. The demonstrated research interest in

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bony pattern trauma demonstrates potential bias from research teams assuming these injury patterns would suffer negative psychological outcomes more than non-bony trauma, however no consensus supporting this has been found within published literature.

Resultant deformity and self-perceived attractiveness following OMF injury is an area of research interest. In general, groups who considered themselves to suffer significant post-injury deformity, including extensive facial scarring, were most likely to demonstrate worse psychological outcomes.[10,13,25,26,29,40,48]

Whether specific mechanisms of injury were associated with worse psychological outcomes was unclear, and often this confounding factor was not accounted for in the interpretation of study results. Those patients who suffered extreme distress during the incident itself[31] or considered the injury to be attributed to someone/something other than themselves[46] had relatively higher levels of psychological distress following their trauma. Whether incidents were the result of interpersonal violence, road-traffic collisions, or workplace incidents did not appear to have a consistent impact on psychological outcomes. Multiple studies reported no significant differences in the mechanism of injury in psychological outcomes,[16,27] whereas others found accidents to be acutely more psychologically distressing, with alleged assault having longer lasting impact.[29]

Facial trauma versus other bodily trauma

Multiple research teams identified OMF injuries were more likely to result in negative psychiatric sequelae than other non-OMF injuries,[32,42,43,49] whilst others disagreed.[10,27,33] Whilst our scoping review did not focus on this topic and did not aim to make direct comparisons between injury groups, this research area certainly warrants further attention to ensure OMF injuries are not overlooked in the holistic care of a polytrauma patient. Depending on local provisions, some polytrauma patients may receive significant post-hospital psychiatric care and support which could significantly differ if patients have suffered solely OMFS related injuries. This discrepancy in funding could be significantly detrimental to a sub-cohort of trauma patients, who we have demonstrated within this scoping review.

Comparison of holistic care and psychiatric provisions can also be made between OMFS facial trauma patients and head and neck cancer patients, often treated by the same surgical specialty. The mental health of head and neck oncology patients and their quality of life is of significant research interest, with numerous tools developed to aid clinicians in their assessment in clinic,[50,51] yet the evidence to support the identification and management of facial trauma patients with psychopathology is scarce.

Limitations

This structured review has several limitations. Due to the nature of the studies included, we do not have any information on the psychiatric needs of patients who did not require an inpatient hospital stay or outpatient OMFS follow up. This subgroup of patients could have had significant needs, but our review has been unable to consider them. Many studies also excluded patients with 'minor' facial injuries (such as lacerations <1.5 cm, or those that were closed with topical glue as opposed to suturing). Again, this group of patients has been under-represented in this review, particularly considering the huge proportion of injuries this will encompass. The long-term impact of using topical glue to close a facial wound is not known, particularly since many of these patients may be young children who will live with the resultant scar and deformity for decades afterwards.

Only two papers were interventional in nature, investigating how to address the psychiatric needs of patients with traumatic facial injuries. Whilst both articles found that an intervention improved subjective psychiatric health when compared to no intervention, any comparison between interventions was not investigated. This area is certainly of huge interest to the OMFS surgeon who would be looking to implement an intervention within their service, as it would guide local funding and resource planning.

Suggested further research

This review has highlighted many areas of potential future research that would benefit the knowledge base of this complex topic. The link between degree of facial disfigurement post-injury and relative impact on mental health outcomes would be of interest, as it could aid the targeting of psychiatric support towards those considered most in need.

Very few papers considered the long-term impact of facial injuries on children/adolescents, and to the best of our knowledge, none of these had follow up periods >12 months. This dearth of evidence suggests that further research with extensive longitudinal outcomes would be of considerable benefit to understanding the long-term implications of facial injury on younger generations.

Conclusions

This review demonstrates the huge psychological impact that orofacial trauma has on patients. Both patients and health care providers see significant potential benefits in a multidisciplinary approach towards mental health following significant facial trauma. This review highlights significant psychological needs in the OMFS trauma population, so much so that psychiatric screening within facial trauma clinics should be considered routine and essential to holistic patient care. OMF surgeons cannot be expected to manage these psychological disturbances, however they are in a prime position to identify those at risk and refer them to appropriate support and services.

Conflict of interest

We have no conflicts of interest.

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Ethics statement/confirmation of patient permission

Not applicable.

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