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POST-TRAUMATIC STRESS DISORDER AND TRAUMATIC BRAIN INURY: COMORBID CLINICAL OUTCOMES IN THE MIDDLE EAST AND NORTH AFRICA REGION

by
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AN ABSTRACT OF THE PROJECT OF

Youssef Omar Al Masri for Master of Science
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Title: Post-Traumatic Stress Disorder and Traumatic Brain Injury: Comorbid Clinical Outcomes in the Middle East and North Africa Region

Traumatic brain injury (TBI) is a major cause of death and disability worldwide affecting the general population as well as military personnel. Specifically, of interest to us is mild TBI (mTBI), which represents ~75% of all TBI cases, and is often accompanied by a number of neurobehavioral/neuropsychological comorbidities including depression, anxiety, substance abuse as well as post-traumatic stress disorder (PTSD). Several elements are shared and overlap between PTSD and mTBI related to post-concussion events that can be delineated on the molecular, cellular and clinical/behavioral levels, and considerable evidence suggests that mTBI can increase the risk of PTSD occurrence. The tendency for this increased risk is related to mTBI-induced stress and inflammatory conditions at the molecular and behavioral levels. In this report, we will provide a general overview on TBI and PTSD, specifically on how mTBI may predispose, and is often accompanied by, PTSD. Furthermore, as Lebanon is considered a consistent battleground often featuring war and injury, we will also shed light on the impact of these two conditions on the Lebanese population, as well as in the Middle East and North Africa (MENA) region. Finally, we will also briefly highlight the gap in the knowledge and lack of research in Lebanon and the MENA region about this particular subject, and how treatment options of these two conditions might be advanced if more studies and investigations were to be conducted.

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ABBREVIATIONS

CAPS: Clinician-Administered PTSD Scale

CRIES: Children's Revised Impact of Event Scale

DICA-R: Diagnostic Interview for Children and Adolescents

DSM: Diagnostic and Statistical Manual for Mental Disorders

GCS: Glasgow Coma Scale

mTBI: Mild Traumatic Brain Injury

MVC: Motor Vehicle Crash

PTSD: Post-Traumatic Stress Disorder

PTSRC: Post-Traumatic Stress Disorder Reaction Checklist

TBI: Traumatic Brain Injury

CHAPTER I

RESEARCH METHODOLOGY

A. Data Sources and Searches

A comprehensive search strategy was developed to assess the comorbid clinical outcomes of traumatic brain injury and post-traumatic stress disorder. Medical Subject Headings (MeSH terms) and keywords related to TBI and PTSD were used to search databases comprehensively. Finally, scientific articles, including experimental studies, systematic reviews, narrative reviews and book chapters were retrieved from PubMed, Medline and Google Scholar. These databases were looked into last on December 15th, 2018.

1. Inclusion Criteria

Studies were considered eligible only if they addressed human patients who have suffered from TBI and/or PTSD in the MENA region in general, as well as in Lebanon specifically.

2. Exclusion Criteria

Abstracts, reviews, case reports, biographies, conference lectures, and editorials were excluded from this report. Studies performed on populations outside the MENA region were also not considered.

B. Data Extraction

The following items were extracted from each included study: reference details (publication year and name), study design and duration, outcome assessments and intervention regimes (if found).

C. Data Analysis and Synthesis

Meta-analysis could not be meaningfully performed because of the heterogeneity among the included studies. Consequently, the data was summarized qualitatively in descriptive text and in summary tables. Critical appraisal of the data was conducted, and meaningful conclusions were acquired from every article included.

CHAPTER II

TRAUMATIC BRAIN INJURY

A. An Overview of Traumatic Brain Injury

Brain injury refers to the occurrence of an insult to the brain which causes altered brain functions. Traumatic brain injury (TBI), defined as an abnormal function of the brain, can occur due to a traumatic event such as a bump, blow, jolt to the head or due to penetrating injury to the head. TBI may also be caused by an external physical force, that could produce an altered state of consciousness, which eventually results in an impairment of cognitive abilities or physical functioning (Pervez, Kitagawa, & Chang, 2018).

Symptoms of a TBI can be mild, moderate, or severe (Table 1), depending on the extent of the damage to the brain (Saatman et al., 2008). A person with a mild TBI could remain conscious or may experience a loss of consciousness for a few seconds or minutes. Other symptoms of mild TBI include headache, confusion, lightheadedness, dizziness, blurred vision or tired eyes, ringing in the ears, bad taste in the mouth, fatigue or lethargy, a change in sleep patterns, behavioral or mood changes, as well as trouble with memory, concentration, attention, or thinking (Dean & Sterr, 2013; Prince & Bruhns, 2017). A person with a moderate or severe TBI may show these same symptoms, but may also have a headache that gets worse or does not go away, along with repeated vomiting or nausea, convulsions or seizures, an inability to awaken from sleep, dilation of one or both pupils of the eyes, slurred speech, weakness or numbness in the extremities, loss of coordination, and increased confusion, restlessness, or agitation (Dixon, 2017; Rabinowitz & Levin, 2014).

Table 1 Classification of Traumatic Brain Injury by Severity Source: adapted from ("VA/DoD Clinical Practice Guideline for Management of Concussion/Mild Traumatic Brain Injury," 2009)

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	0-30 minutes	>30 minutes <24 hours	> 24 hours
Alteration of consciousness/mental state	A moment up to 24 hours	>24 hours	>24 hours
Posttraumatic amnesia	0-1 day	>1 and <7 days	>7 days
Glasgow Coma Scale	13-15	9-12	<9

Sixty-nine million individuals are estimated to suffer from TBI due to all its causes each year, with the Southeast Asian and Western Pacific regions experiencing the greatest overall burden of the disease. Head injury following road traffic collision is more common in low-and middle-income countries, and the proportion of TBIs secondary to road traffic collision is likewise the highest in these countries. Meanwhile, the estimated incidence of TBI is highest in regions with higher-quality data, specifically in North America and Europe (Dewan et al., 2018). An estimated 10 million people will be affected annually by TBI by the year 2020, and it is predicted to become the third leading cause of global mortality and disability, making it a major economic, social, and health challenge (Hyder, Wunderlich, Puvanachandra, Gururaj, & Kobusingye, 2007; Rockhill, Fann, Fan, Hollingworth, & Katon, 2010).

B. TBI Prevalence Rates and Occurrences in Lebanon

Lebanon, a small Middle Eastern country that is known for its religious and ethnic diversity, was devastated by over 15 years of civil war and several external invasions, as well as numerous occasional outbursts of violence, which eventually tore the country apart (M. C. Haddad, Khoury, & Hourani, 2008; Shaar, 2013). Nonetheless,

it was able to regain its strength in the past few years, but this comeback was unfortunately not reflected on its weak, and sectarian-based health system (Blanchet, Fouad, & Pherali, 2016; Kronfol, 2006). One of the major health challenges that Lebanon is currently facing includes the underestimated injury rates caused by these wars and their long-term consequences, particularly TBI rates (Y. Fares, Fares, & Gebeily, 2014). Recently, there has been an increased interest in assessing the neuropsychological outcomes, such as PTSD and depression, following traumas in the Lebanese population; however, these studies have not attempted to investigate the upstream instigators that lead to the occurrence of these disorders in the first place, such as TBI specifically (Y. Fares et al., 2013; L. F. Farhood & Dimassi, 2012; L. F. Farhood & Noureddine, 2003). Additionally, current TBI studies suffer from major flaws pertaining to lack of appropriate demographic reporting, inadequate TBI categorization and case ascertainment, incomplete supporting medical charts documentation, and faulty biochemical and clinical testing.

The following table (Table 2) shows a brief description of the epidemiology and outcomes of TBI in Lebanon. The principal findings from these studies included the incidence rate of TBI, demographic characteristics, mechanisms of injury, injury severity, and the associated complication of TBI.

Table 2 Summary of some original studies published in Lebanon from 1991 to 2013 that assessed traumatic brain injury or head injury in Lebanese patients

Author (Year)	Study Design and Duration	Study Sample Size and Criteria	Male/Female Ratio	Major Cause of Injury	Severity of Injury	Complications
(Y. Fares et al., 2013)	Prospective Cohort Study at the Neurosurgery Division at the Lebanese University (Aug 14, 2006 – Feb 15, 2013)	417 patients (7% injured in the head and face region; 29 cases of interest) Inclusion: patients exposed to cluster bombs and assessed using Fares' Scale	76%/24%	Cluster munitions' blasts	7 penetrating TBI cases (24%); 11 closed TBI cases (38%)	PTSD 100% of cases MDD 72% ASD 14% GAD 79%
(Habre, 2012)	Retrospective Cross-sectional Study at the American University of Beirut Medical Center (Feb 1, 2010-July 31, 2010)	175 patients admitted to the emergency department at AUBMC	None reported	Falls (42.1%), MVC (20.7%), strikes against/bumping into something (16.5%), assaults (10.7%)	98 cases of mild TBI (96.1%); 3 moderate TBI cases (2.9%); 1 unknown case (1%)	None reported

Author (Year)	Study Design and Duration	Study Sample Size and Criteria	Male/Female Ratio	Major Cause of Injury	Severity of Injury	Complications
(Mansour et al., 2009)	Retrospective Cohort Study at the American University of Beirut Medical Center (1980-1996)	841 patients divided into two age groups: Pediatric (0-16 years) Adults (▷ 16 years)	War Injuries (84.7%/15.3%) Domestic Injuries (75.1%/4.9%)	War injuries (64.7%); rocket shrapnel (77.2%), gun (17%), mine (5%), and hand grenade (7%) Domestic Injuries (35.3%)	16 out of 841 patients had a brain injury	None reported
(Nohra, Maarrawi, Samaha, Rizk, & Okais, 2002)	Retrospective Cohort Study at Hotel-Dieu France (1975-1990)	272 craniocerebral traumas	None reported	Missile head injuries	201 penetrating TBI cases; 69 closed TBI; 2 unknowns	Infections (31 cases); Fistulae (29); sinus (31); mortality rate due to noninfectious diseases (33 cases)
(J. M. Taha, Haddad, & Brown, 1991)	Prospective Cohort Study at the American University of Beirut Medical Center (1981-1988)	600 patients out of which 30 were of interest	93.3%/6.7%	Missile injuries; bullet (57%) and shrapnel fragment (43%)	GCS score; 4-5 (7 cases) 6-8 (11 cases) 9-12 (4 cases) 13-15 (8 cases)	30 cases of intracranial infections; 15 cases of seizures; mortality rate (43% out of all 600 admitted)

Several observations can be made concerning the studies. First, the causes of TBI in Lebanon can be organized into two major groups: the first relates to war and blast injuries, and the second relates to domestic injuries. Second, all the studies had evaluated TBI patients and victims from incidents of war and conflict. Third, all the studies failed to mention or investigate the psychological consequences of TBI and head injuries. Finally, there is a huge variation among the studies when it comes to inclusion and exclusion criteria, assessment tools, mortality rate reporting, and study design. All the previously indicated observations shed light on the insufficient data available to assess the current situation of TBI in Lebanon. More studies have to be conducted in the future in order to implement better prevention programs.

B. TBI Prevalence Rates and Occurrences in the MENA Region

Despite being a region of turmoil, the epidemiology of TBI in the Middle East and North Africa regions remains understudied; less than two thirds of the countries from this region have publications that adequately describe TBIs in their local context (El-Menyar, Mekkodathil, Al-Thani, Consunji, & Latifi, 2017). Table 3 shows a brief description of the epidemiology and outcome of TBI in the Arab World. Of the 22 Arab countries, only 8 have reported studies that provided information on the frequency, risk factors, injury severity, and mortality associated with TBIs. The principal findings from these studies included the incidence rate of TBI, demographic characteristics, mechanisms of injury, injury severity, and mortality burden and rate.

Table 3 Summary of some original studies published from 2006 to 2018 that assessed traumatic brain injury or head injury in patients from Arab countries

Author (Year)	Country and Study Duration	Study Sample Size and Inclusion/Exclusion Criteria	Male/Female Ratio	Major Cause of Injury	Severity of Injury	Mortality
(Omar et al., 2010)	Qatar, 2002-2008	65 severe TBIs Inclusion: severe TBI; children $\leq$ 14. Exclusion: deaths before arrival at hospital and patients with missing data	73.8%/26.2%	Road traffic accidents (84.6%) and falls (10.8%)	All were severe cases; mean GCS: 6.2 $\pm$ 1.9	18.5%
(El-Menyar, Consunji, et al., 2017)	Qatar, 2010-2014	945 pediatric TBIs (all ages $\leq$ 18) Inclusion: infants/toddlers (0-4 years), school age (5-9 years), adolescents (10-14 years), and teenagers (15-18 years) Exclusion: patients who were not admitted	81%/19%	Motor vehicle (47.3%) crashes and falls (21.6%)	All were pediatric cases; mean GCS: 8.7 $\pm$ 4.3	13%

(Darwazeh et al., 2018)	North of Palestine, 2000-2010	520 patients Inclusion: civilians (6 months to 75 years of age) Exclusion: patients who had received surgical management at other hospitals, were dead on arrival, lost to follow-up, or whose cause of death was not related to TBI caused by missile wounds	90.4%/9.6%	Metallic bullets (351 cases), rubber bullets (139) and shrapnel from bomb explosions (30 cases)	GCS score: 3-7 in 24 children and 72 adults and 8-15 in 116 children and 308 adults	12.7%
(Younis, Younis, Hamidi, Musmar, & Mawson, 2011)	Palestine, 2006 and 2007	312 patients diagnosed with TBIs Inclusion: patients admitted to the emergency departments of three hospitals in Nablus, Palestine Exclusion: cases with insufficient data	81.1%/18.9%	Assault (33%), falls (32.1%), road traffic and crashes (29.8%)	53.8% of cases: mild TBI (GCS: 13-15)	7%

(S. Haddad et al., 2011)	KSA, 2001-2008	477 patients with severe TBI Inclusion: adult (≥18 years) patients with TBI admitted to ICU Exclusion: brain death on admission to ICU	95.8%/4.2%	Not mentioned	All were severe cases; GCS: 3-4 (48% of cases), 5-6 (23%0, and 7-8 (28%)	In-hospital: 16% ICU: 12%
(Arab et al., 2015)	KSA, 2010-2011	368 minor head trauma patients Inclusion: minor head injuries; CGS 13-15, age ≥14 years Exclusion: acute neurologic deficit; penetrating skull injury; presented after 24 hours after injury; pregnancy; known history of seizures; bleeding disorder; returned for reassessment	78%/22%	Motor vehicle accidents (67.6%), falls (19.5%), and strikes on the head (12.9%)	All cases were mild head trauma; GCS: (15) 93%; (13-14) 7%	No mortality was reported caused by mild head trauma

(M. M. Taha & Barakat, 2016)	Egypt	2124 patients with traumatic brain injury Inclusion: not reported Exclusion: not reported	82.7%/17.3%	Road traffic accident (73.7%)	62.1% mild head injury, 17.5% moderate, 20.3 severe	14.3%
(Klimo, Ragel, Jones, & McCafferty, 2015)	Iraq, 2004-2012	268 children with severe isolated head trauma in Iraq during Operation Iraqi Freedom Inclusion: pediatric head injury; age <18 years; isolated serious head injury; during Operation Iraqi Freedom Exclusion: not reported	75.7%/24.3%	Improvised explosive device (49.3%), blast (20.1%), mortar (13.1%), gunshot wound (11.6%)	All cases were severe; median (range) GCS: 7 (3-15)	25.7%
(Al-Kuwaiti, Hefny, Bellou, Eid, & Abu-Zidan, 2012)	UAE, 2003-2006	589 patients Inclusion: age range 1-89 years Exclusion: not reported	88.3%/11.7%	Road traffic collision (67.1%), fall from height (11.9%)	Mild injury (82.2% of cases), moderate (5.7%), & severe (12.1%) The median (range) GCS was 15 (3- 15).	5.9%

(Bahloul et al., 2004)	Tunisia, 1997-1999	437 adult patients with head injury admitted to the ICU Inclusion: patients admitted directly from the scene of the accident within 6 hours of injury (age range 15-98 years) Exclusion: patients with a normal GCS score and CT scan, patients with associated cervical spine fracture and quadriplegia, and patients younger than 14 years	90%/10%	Traffic accidents (85.6%)	58% of cases were serious (CGS: ⩽8)	29.1%

An analytical view of the studies above reveals some common trends among Arab countries. First, male predominance in patients with TBIs/ head injuries was present across all age groups, including children and infants. Second, the most common mechanism of injury in most studies was motor vehicle crashes (MVCs), followed by falls. Third, the social and economic burdens of TBI in the studied countries were not explored at all. This all indicates that the epidemiology of TBI in the Arab World remains understudied. The use of a globally recognized definition of TBI will contribute greatly to improve its reporting, analysis, and interpretation, as well as to establish appropriate injury prevention programs.

CHAPTER III

POST-TRAUMATIC STRESS DISORDER

A. An Overview of Post-Traumatic Stress Disorder

PTSD is a mental disorder that may develop after exposure to exceptionally threatening or horrifying events such as car accidents, fights or brawls between two or more persons, sexual assault, natural disasters or war and terror events. It can occur after a single traumatic event or from prolonged exposure to trauma, such as sexual abuse in childhood. (Bisson, Cosgrove, Lewis, & Robert, 2015). Patients with PTSD are at an increased risk of experiencing poor physical health; including somatoform, cardiorespiratory, musculoskeletal, gastrointestinal, and immunological disorders (Gupta, 2013; Schnurr, Green, & Kaltman, 2007). It is also associated with substantial psychiatric comorbidity (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), increased risk of suicide (Sareen et al., 2007), and considerable economic burden (Ferry et al., 2015; Kessler, 2000; Wang, Simon, & Kessler, 2003).

Symptoms usually begin within 3 months of the traumatic incident, although sometimes they may begin later. For symptoms to be considered PTSD symptoms, they must last more than a month, and be severe enough to interfere with proper functioning in relationships or work. The course of the illness varies from person to person. Some people recover within 6 months, while others have symptoms that last much longer, even ultimately becoming chronic conditions. To be diagnosed with PTSD, an adult must experience all of the following for at least 1 month: the minimum of one re-experiencing symptom, one avoidance symptom, two arousal and reactivity symptoms and two cognition and mood symptoms. PTSD is often accompanied by depression,

substance abuse, or one or more anxiety disorders (American Psychiatric Association, 2013).

A recent study involving 24 countries used the World Mental Health (WMH) surveys to assess PTSD in the general population. Data from those surveys revealed that trauma exposure is common throughout the world, that this exposure is unequally distributed in the population, and finally that PTSD risk differs substantially across trauma types, with traumas involving interpersonal violence carrying the highest PTSD risk. Furthermore, the surveys indicated that over 40% of all reported trauma experiences qualify for a diagnosis of PTSD, which directly implies a high prevalence rate of PTSD worldwide (Atwoli, Stein, Koenen, & McLaughlin, 2015; Kessler et al., 2017).

B. PTSD Prevalence Rates and Occurrences in Lebanon

For decades, Lebanon has been a country plagued with political, economic and social instability leading to several wars (The Civil War 1975-1990The Grapes of Wrath 1996 War, The July 2006 War) and vicious cycles of outbursts of violence (Karam, Karam, & Mansour, 1996; Khamis, 2012; Shaar, 2013). The sequela of such periods of civil strife and war episodes have led to a dramatic increase in the prevalence of traumas amongst the Lebanese population. Most of these traumas were sustained by war and blast related injuries from cluster munition, bombing and the destruction of infrastructure (J. Fares et al., 2017; L. Farhood et al., 1993). Table 4 shows a brief description and epidemiology of PTSD studies that have been conducted in Lebanon.

Table 4 Summary of some original studies on the prevalence of post-traumatic stress disorder in Lebanon

Study	Study Design	Setting	Scale Used	Sample Size	Age (years)	Cause of PTSD	PTSD Prevalence
(Macksoud & Aber, 1996)	Cross-sectional	Public and private schools in Beirut	DSM III R and PTSRC for Children	224 (51.8% girls, 47.7% boys)	10-16	The Lebanese Civil War	Not reported
(Shaar, 2013)	Cross-sectional	Public and private schools in Beirut, Mount Lebanon and Sidon	DSM III R and PTSRC for Children	322 (60.2% girls, 39.8% boys) Subsample: 163 disabled 163 able-bodied	10-20	The Lebanese Civil War	Disabled (3.7%) Able-bodied (11.7%)
(Karam et al., 1996)	Cross-sectional	Public and private schools in South Lebanon and West Bekaa	DSM III R and DICA-R	402	6-17	The Grapes of Wrath 1996 War	21.6%
(Karam, Fayyad, & Salamoun, 2007)	Cross-sectional	Private and public schools in Southern Suburb of Beirut and South Lebanon	DSM III R and CRIES	709	12-18	The July 2006 War	15.4%
(Khamis, 2012)	Cross-sectional	Public schools in South Lebanon	DSM IV and clinical interviews	300 (59% girls, 41% boys)	12-16	The July 2006 War	25.7%

(J. Fares et al., 2017)	Prospective Longitudinal	Lebanese civilian victims of the July 2006 War	DSM V	244 (6% female, 94% male) Subsample: 239 diagnosed with PTSD	18-67	Cluster munitions	Subsample: 98% in 2006 43% in 2016
(Khamis, 2015a) Khamis (2015)	Cross-sectional	Private and public schools in the Greater Beirut Area	DSM IV and clinical interviews	665 (51.7 girls, 48.3 boys)	12-18	Bullying	20.8%
(Ghaddar, Elsouri, & Abboud, 2016)	Retrospective Survey	Lebanese women prisoners previously imprisoned in the Khiam Detention Center during the Israeli occupation of Lebanon (1981-1999)	CAPS	67 former women prisoners	31-76	Torture and imprisonment	28.4%

Four main conclusions can be noted from the above table. Firstly, there is a relatively small number of studies on PTSD in Lebanon which might suggest a lack in reporting mental health-related issues. Secondly, there is a significant variation in the prevalence rate of PTSD across time. The third main finding shows that the majority of available studies on PTSD in Lebanon focus on war as the main factor behind the disorder. Few other studies mention different causes such as imprisonment or bullying. Finally, there appears to be a trend in the sex of the patients suffering from PTSD; most of the studies listed above indicate that more female patients suffer from PTSD than males in similar clinical situations. Overall, more research has to be done in order to fill the gaps in the knowledge and begin attempting to work on an effective management, or even a preventive tool for PTSD.

B. PTSD Prevalence Rates and Occurrences in the MENA Region

Not only did war and conflict affect Lebanon greatly, they've also managed to inflict damage on most of the Arab countries in the MENA region. Most of these conflicts were due to years of dictatorship that the civilians of these regions for the most part unwillingly tolerated. Recently, with access to technology and a modern lifestyle, people were exposed to the ways in which they were being repressed, and how devoid they were of their basic human rights. This eventually led to the rise of several major political events and movements beginning with the Arab Spring, and followed by numerous wars in Syria, Palestine, Yemen and Iraq (Neria, Bravova, & Halper, 2010). The outburst of continuous and perpetual violence across the MENA region has also caused a global outpouring of refugees. Civilians were forced to seek asylum and refuge in neighboring Arab countries as well as in Europe. In one study, the general population

prevalence of PTSD ranged widely from less than 1 % to more than a third of the sampled countries, with higher rates consistently reported among children and in areas of recent or ongoing conflict (Khamis, 2015b).

The following table (Table 5) includes a brief sum-up of different studies conducted in the MENA region on the prevalence and incidence of PTSD across different communities and groups.

Table 5 Summary of some original studies on the prevalence of post-traumatic stress disorder in the Arab World

Study	Study Design	Setting	Assessment Tools	Sample Size	Age (years)	Cause of PTSD	PTSD Prevalence
(de Jong et al., 2001)	Epidemiological survey conducted between 1997-1999	Survivors of war or mass violence who were randomly selected from community populations in Algeria	PTSD module of the Composite International Diagnostic Interview version 2.1	653 (54.3% male, 45.7% female)	Mean: 40.6	Armed conflict and random terror attacks	37.4%
(de Jong et al., 2001)	Epidemiological survey conducted between 1997-1999	Survivors of war or mass violence who were randomly selected from community populations in Gaza	PTSD module of the Composite International Diagnostic Interview version 2.1	585 (46.8% male, 53.2% female)	Mean: 31.6	Conflict-related events and adverse domestic events	17.8%
(Alyahri & Goodman, 2008)	Cross-sectional survey	Yemeni schoolchildren who were living either in the city of Mukalla or the rural area of Tuban	The Strengths and Difficulties Questionnaire (SDQ) and The Development and Well-Being Assessment (DAWBA)	1,210 (50.25% male, 49.75 female)	7-10	Civil wars and rapid sociological and cultural changes	0.2%

(Al-Jawadi & Abdul-Rhman, 2007)	Cross-sectional study	Children in two primary health care centers in Mosul city, the center of the Nineveh governorate in the north of Iraq	A standardized questionnaire form which included the diagnostic criteria taken from DSM-IV-TR2000	3,079 (55.1% male, 44.9% female)	1-15	Wars and sanctions	10.5%
(Khamis, 2005)	Stratified random sample	Palestinian adolescents from private and UNRWA schools in East Jerusalem and the West Bank	The child characteristics and family data sheet and DSM-IV	1,000 (52.3% male, 47.4% female)	12-16	Political traumas inflicted by the Israeli army	34.1%
(Moisander & Edston, 2003)	Comparative assessment	Syrian refugees (who were torture victims) from the Centre for Trauma Victims in Stockholm (KTC)	Psychiatric evaluation performed at KTC and based on a standardized test procedure	24 (100% male)	Mean: 37.3	Torture (blunt force, sharp weapons and burn)	68.8%

(Abdeen, Qasrawi, Nabil, & Shaheen, 2008)	School-based national screening	Palestinian school children in the West Bank and Gaza, Palestine (academic year 2004-2005)	Self-reported questionnaires (event exposure, emotional reactions to exposure, UCLA PTSD Index and the Functional Impairment Questionnaire)	2,100 (55% male, 45% female)	14-17	Exposure to Israeli occupation	35-36%
(El Hatw, El Taher, El Hamidi, & Alturkait, 2015)	Retrospective cohort study conducted in July 2010	Saudi children exposed to the 2009-2010 Jazan war	Child Behavior Inventory and DSM-IV-RT	186 (male: female ratio of 1.6:1)	5-16	Armed conflict	13%
(Al-Turkait & Ohaeri, 2008)	Cross-sectional, face-to-face interview-based study	Kuwaiti military men (retired, active in the army, in-battle and prisoners of war)	The Clinician Administered PTSD Scale	200 (100% male)	24-71	Involvement in the First Gulf War	31.5%
(Rabie, El-Sheikh, ElSayed, Fekry, & Saad, 2015)	Cross-sectional study	A sample of Egyptian adolescents from public and private schools in Tanta	PTSD Checklist – Civilian Version (PCL-C) & Mini International Neuropsychiatric Interview (MINI-KID)	423	12-18	Aftermath of the Arab Spring revolution	16.31%

The research conducted in the Middle East and North Africa region suggests that the emotional burden carried by trauma-exposed adults and children is significant. Although some data from general-population studies specify relatively low prevalence rates of PTSD in the community, results from other community studies and especially from research on highly-exposed groups in Middle Eastern societies indicate high PTSD rates. This may be extremely devastating for large populations of victims, especially if this emotional impact remains undiagnosed and untreated.

Across the above-mentioned studies, the most documented demographic risk factors for PTSD onset are female gender and young age. Remarkably, and consistent with other PTSD studies, the magnitude of the exposure to the event (e.g., degree of physical injury, immediate risk of life, severity of property destruction, and frequency of fatalities) is the strongest predictor of the development of PTSD. The majority of studies conveyed in this report have used cross-sectional designs, and their results are additionally limited by variability in sample types and sizes, time-points for assessments since trauma, as well as the instruments used.

CHAPTER IV

TBI AND PTSD

Although PTSD and TBI are categorized as separate and discrete disorders, the boundary between them is sometimes indistinct. Their separation is based on the assumption that PTSD results primarily from psychological stress, while TBI is the consequence of an identifiable injury to the brain (Andreasen, 2011). The mild type of TBI (mTBI) is most often suffered by soldiers and civilians, and it is this form of TBI that is the most common, and has previously often been overlooked or deemed inconsequential. The incidence of hospital-treated patients with mTBI injury is about 100-300/100,000 population (Bruns & Hauser, 2003; Saatman et al., 2008). The long-term consequences of TBI, and mTBI in specific, do not affect the TBI survivor alone, but also the community he/she lives in, therefore creating massive psychological and economical burdens (Hyder et al., 2007). The brain injuries sustained can predispose the individuals affected to post-traumatic stress disorder (PTSD), and several other serious mental disorders (Chen & Huang, 2011; L. Farhood, Dimassi, & Lehtinen, 2006; L. Farhood et al., 1993; L. F. Farhood, Fares, Sabbagh, & Hamady, 2016; L. F. Farhood & Noureddine, 2003). Now considering that the prevalence of TBI in Lebanon is considerable and drastic, then that correlates that the incidence of PTSD is also unquestionably substantial.

Both PTSD and TBI commonly occur in the general population, and the two share some pathophysiological characteristics and both affiliate to cognitive impairment, behavioral changes and sleep disruption. PTSD and TBI present a number of overlapping symptoms, which can sometimes lead to over-diagnosis or misdiagnosis

(Bryant, 2011). Both conditions are associated with co-morbidities which are vital in diagnosis and treatment planning (Combs et al., 2015).

Therefore, more research is needed to be done on what treatments are effective in PTSD and TBI co-morbidity, and on the factors predictive of treatment success. There is also the need to implement screening programs for PTSD in vulnerable populations who were, and still are consistently being exposed to war trauma such as in Lebanon, Syria, Palestine and others. The necessity of effective reporting, adequate classification systems of TBI and the need of efficient follow-up strategies of TBI-affected individuals are critical for providing the care and support to suffering patients.

CHAPTER V

FINAL REMARKS

This overview report uncovered that there are considerable methodological variations and inconsistencies among the reported studies in evaluating both TBI and PTSD in Lebanon and the MENA region. Furthermore, it provides sufficient data to identify potential gaps that the MENA region, in general, and Lebanon, in specific, face in the field of TBI and PTSD, not only in terms of burden and management, but also with respect to future research.

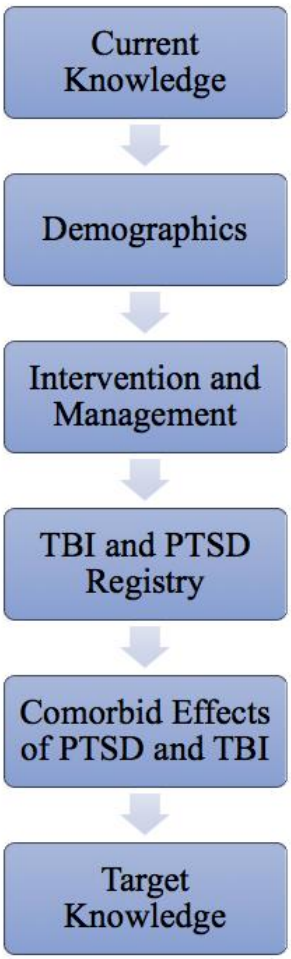

Figure 1 Proposed future research steps to fill in the gaps in knowledge

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