



A large, abstract background image of fire or flames in shades of orange, red, and yellow against a black background, occupying the left two-thirds of the page.

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Mental Disorders among Burn Patients

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RESEARCH

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Mental Disorders among Burn Patients

ACADEMIC DISSERTATION

To be presented with the permission of the Faculty of Medicine, Institute of Clinical Medicine,
Department of Psychiatry, University of Helsinki, for public examination at the Christian Sibelius-
auditorium, Väiskärinkatu 12, Helsinki, on January 28th, 2011, at 12 noon.

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Cover photo: Pekka Maskuniitty

Layout: Marjut Grainger

ISBN 978-952-245-396-9 (printed)

ISBN 978-952-245-397-6 (pdf)

ISSN 1798-0054 (printed)

ISSN 1798-0062 (pdf)

Helsinki University Print
Helsinki, Finland 2010

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*"To my wife and my daughters,
and to my parents and my brother"*

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Abstract

Raimo Palmu, Mental Disorders among Burn Patients

National Institute for Health and Welfare (THL), Research 49, 105 pages. Helsinki 2010.

ISBN 978-952-245-396-9 (printed), ISBN 978-952-245-397-6 (pdf)

This entity of studies investigating mental disorders and suicide attempts among acute burn patients was a collaborative research project between National Institute for Health and Welfare, Helsinki and Departments of Psychiatry and Plastic surgery in University of Helsinki, Finland. It was realized in Helsinki Burn Centre, in Töölö Hospital in two parts.

The first cohort of burn patients consists of all burn patients (N=811) admitted to the Helsinki Burn Centre during 1989-97. The aim of the study was to investigate the proportion of burn patients who had attempted suicide and differences in their characteristics, as compared with other burn patients admitted to the Burn Centre during the same time period. Burn patients were first drawn from a computerised register, after which a psychiatrist examined their medical records and ascertained the suicide attempters.

In this retrospective cohort, 5.7% (N=46) of the total of 811 burn patients had attempted suicide. The burn severity of suicide attempters was markedly higher than in the other burn patients. Flame was the method mostly used and much more common cause of burns among suicide attempters than among the remainder. Suicide attempters were also more often unemployed or on disability pension before the injury.

The second sample was a prospective cohort of all acute consecutive burn patients admitted to the Helsinki Burn Centre during May 1st 2006- October 31st 2007. The most important aim was to investigate the prevalence of mental disorders in different time frames prior to and after the burn among acute hospitalized burn patients. In addition, the correlation of burn severity and mental disorders in different time frames was investigated. Further, the proportions of burn patients receiving psychiatric consultation or care in the entire cohort and whether psychiatric care actually received relates to pre-burn psychiatric treatment history, estimated need for psychiatric care, or burn severity was investigated.

First, all subjects (N=107) of the cohort were interviewed by an experienced psychiatrist with the Structured Clinical Interview for DSM-IV for Axis I and II mental disorders (SCID-I and SCID-II) assessed in three time frames (lifetime, the month prior to burn and

in acute care) at baseline and then 86 % of all (N=92) with SCID-I at the end of six-month follow-up for post-burn time frames. Information on clinical features, psychiatric symptoms and personality traits was also gathered. The same self-report questionnaires for psychiatric symptoms were repeated at the end of follow-up as filled at baseline. The burn severity estimate was TBSA which indicates to the percentage of burned skin area of total body surface area.

In this prospective cohort of acute burn patients, most (61%) patients had at least one lifetime Axis I or II mental disorder before burn. Prevalences of lifetime substance-related disorders (47%), psychotic disorders (10%) and Axis II personality disorders (23%) were high. The overall prevalence of Axis I mental disorders increased significantly from the month prior to burn to acute care but decreased significantly from acute care to six months. However, more than one half (55%, N=51/92) of the cohort suffered from some mental disorder during follow-up. Less than one half of the burn patients with estimated need for psychiatric care and 20 % of all burn patients received psychiatric care. TBSA independently and strongly predicted risk for mental disorders during follow-up and pre-burn psychiatric history, severe burns (TBSA>20%) and estimated need for psychiatric care significantly predicted psychiatric care received.

Although the proportion of patients with self-inflicted burns among all burn patients is not high, the markedly higher severity of their burns and commonly present psychiatric history makes them an important clinical subgroup in Burn Centres. Mental disorders, particularly substance use disorders, psychotic disorders, and personality disorders are common among acute burn patients before injury. These disorders may predispose to burns. After burn injury, more than half of the patients suffer from some type of mental disorder, not limited to depression and post-traumatic stress disorder (PTSD), but the prevalence declines over time after the acute phase. A strong relationship likely exists between burn severity and some post-burn mental disorders. After hospitalized burn injury, less than half of the patients with mental disorders and unequivocal need for psychiatric care actually received it. Psychiatric consultations and care follow the course of acute burn treatment, not often later emerging mental disorders. Previous psychiatric history seems to strongly influence care decisions.

Keywords: burns, suicide attempt, TBSA, SCID, mental disorders, prospective study, post-burn psychiatric care.

Tiivistelmä

Raimo Palmu, Mental Disorders among Burn Patients [Palovammat ja mielenterveys]
Tervyden ja hyvinvoinnin laitos (THL), Tutkimus 49, 105 sivua. Helsinki 2010.
ISBN 978-952-245-396-9 (painettu), ISBN 978-952-245-397-6 (pdf)

Tämän väitöskirjatutkimuksen aiheina olivat palovammepotilaiden mielenterveyden häiriöt ja palovammaitsemurharytykset. Tutkimuskokonaisuus oli Tervyden ja hyvinvoinnin laitoksen ja Helsingin yliopistollisen keskussairaalalan psykiatrian ja plastiikkakirurgian klinikoiden yhteistyöprojekti. Se toteutettiin Helsingin palovammakeskuksessa, Töölön sairaalassa.

Ensimmäinen tutkimuskohortti koostui kaikista ($N=811$) vuosina 1989-1997 Helsingin palovammakeskuksessa hoidetuista palovammepotilaista. Tutkimuksen tavoitteena oli selvittää itsemurhaa yrittäneiden palovammepotilaiden osuus kaikista kyseisenä aikana hoidetuista palovammepotilaista ja se, missä suhteessa itsemurhaa yrittäneet eroavat muista palovammepotilaista. Tutkimusaikana hoidetut uudet palovammepotilaat etsittiin ensin Palovammarekisteristä ja sen jälkeen psykiatrian erikoislääkäri seuloi esiin itsemurhaa yrittäneet palovammepotilaat sairauskertomustietojen perusteella.

Tässä retrospektiivisessä kohortissa itsemurhaa yrittäneiden osuus oli 5,7 % ($N=46$) kaikista 811 palovammepotilaista. Itsemurhaa yrittäneillä potilailla oli merkittävästi vaikea-asteisempia palovammoja kuin muilla palovammepotilailla. Liekkipalovamma oli yleisin palovammatyyppi koko potilasotoksessa ja paljon yleisempi itsemurhaa yrittäneiden potilaiden kuin muiden palovammepotilaiden joukossa. Itsemurhaa yrittäneet potilaat olivat myös muita palovammepotilaita useammin työttömiä tai työkyvyttömyyslääkkeellä juuri ennen palovammaa.

Toinen otanta oli kaikkien niiden peräkkäisten potilaiden prospektiivinen kohortti, jotka oli otettu uuden akuuttipalovamman vuoksi osastohoitoon Töölön sairaalassa sijaitsevaan Helsingin palovammakeskukseen 1.5.2006-31.10.2007. Tämän tutkimuksen päätavoitteena oli selvittää mielenterveyden häiriöiden yleisyys akuutisti sairaalahoitoa tarvitsevien palovammepotilaiden joukossa - palovammaa ennen ja sen jälkeen. Tutkimuksessa selvitettiin lisäksi palovamman vaikeusasteen ja mielenterveyden häiriöiden korrelatiota eri aikavaiheissa. Tässä tutkimuksessa selvitettiin myös, kuinka suuri osa näistä

palovammapotilaista tutkittiin psykiatrisessa konsultaatiossa tai kuinka suuri osa heistä sai eriasteista psykiatrista hoitoa. Lisäksi tutkittiin, olivatko aiempi psykiatrinen hoitohistoria, palovamman vaikeusaste tai palovamman jälkeinen psykiatrisen hoidon tarve yhteydessä saatuun psykiatrisen hoitoon.

Kokenut psykiatran erikoislääkäri tutki kaikki (N=107) kohortin potilaat DSM-IV tautiluokitukseen perustuvalla strukturoidun kliinisen diagnostisen haastattelun (SCID-I ja SCID-II) menetelmällä. Tämä tapahtui ensin palovammaosastolla akuuttihoidon aikana, jolloin ykkösakselin (Axis I) ja kakkosakselin (Axis II) mielenterveydenhäiriöt tutkittiin kolmen aikavaiheen suhteen (palovammaa edeltävä koko elämä ja viimeinen kuukausi sekä palovamman jälkeinen akuuttihoitovaihe). Myöhemmin 6 kuukauden kuluttua, sama psykiatri tutki 86 % (N=92) kohortin potilaista uudelleen SCID-I haastattelua käyttäen palovamman jälkeisten häiriöiden (6kk) osalta. Tutkimuksessa kerättiin myös tietoa klinisistä tekijöistä, potilaiden psykiatrista oireista ja persoonallisuudesta. Potilas täytti samat, psyykkisiä oireita kartoittavat itsearviontilomakkeet lähtötilanteessa ja seurannan päätteeksi. Palovamman vaikeusastetta arvioitiin palaneen ihoalueen osuudella koko ihon pinta-alasta (TBSA, total body surface area).

Tässä prospektiivisessa akuuttipalovammapotilaiden otoksessa ennen palovammaa suurimmalla osalla (61 %) potilaista oli ollut vähintään yksi ykkös- tai kakkosakselin mielenterveydenhäiriö. Päihdehäiriöiden (47 %), psykoottisten (10 %) ja persoonallisuushäiriöiden (23 %) esiintyvydet olivat suuria. Ykkösakselin häiriöiden kokonaissesiintyvyys nousi merkittävästi palovammaa edeltävän kuukauden aikaisesta akuuttihoidon aikaiseen, mutta laski merkittävästi akuuttihoidon aikaisesta seurannan viimeisen, kuuden kuukauden aikaiseen. Kuitenkin yli puolella (55 %, N=51/92) kohortin potilaista oli jokin mielenterveydenhäiriö seurannan aikana. Alle puolet niistä palovammapotilaista, joilla tutkimuksen perusteella arvioitiin olevan psykiatrisen hoidon tarve ja 20 % kaikista palovammapotilaista, sai psykiatrista hoitoa. Palovamman vaikeusaste (TBSA) ennusti vahvasti mielenterveydenhäiriön riskiä seurannan aikana. Aiempi psykiatrinen hoito, vaikea-asteiset palovammat (TBSA>20 %) ja tutkimuksessa arvioitu psykiatrisen hoidon tarve ennustivat saatua psykiatrista hoitoa.

Vaikka itsemurhaa yrittäneiden osuus kaikista palovammapotilaista ei ole suuri, heidän palovammojensa vaikeusaste ja heillä usein esiintyvät mielenterveyden häiriöt, tekevät heistä palovammakeskuksien tärkeän kliinisen alaryhmän. Mielenterveydenhäiriöt, erityisesti päihteiden käytöön liittyvät häiriöt, psykoosit ja persoonallisuushäiriöt, ovat yleisiä akuutin palovamman vuoksi hoidetuilla potilailla. Nämä häiriöt voivat myös altistaa palovammoille. Vaikka palovamman jälkeen yli puolella palovammapotilaista oli todettavissa jokin mielenterveyden häiriö, ei pelkästään masennus tai traumaperäinen stressihäiriö (PTSD), mielenterveyden häiriöiden kokonaissesiintyvyys laski palovammahoidon

akuuttivaiheen jälkeen seurannan aikana. Palovamman vaikeusaste ja mielenterveyden häiriöiden esiintyvyys vammautumisen jälkeen liittyvät vahvasti toisiinsa. Alle puolet niistä, joilla todettiin jokin mielenterveydenhäiriö tai kiistaton psykiatrisen hoidon tarve sairaalahoitoa vaatineen palovamman jälkeen, saivat psykiatrista hoitoa. Se, toteutuuko psykiatrin konsultaatio ja psykiatrin hoito palovamman jälkeen, näyttää riippuvan enemmän akuutin palovammahoidon kulusta kuin usein myöhemmin, vähitellen ilmaantuvien mielenterveydenhäiriöiden kulusta. Aikaisempi psykiatrin sairaushistoria näyttää vaikuttavan suuresti hoitoratkaisuihin.

Avainsanat: palovammat, itsemurhayritys, TBSA, SCID, mielenterveyden häiriöt, prospektiivinen tutkimus, palovamman jälkeinen psykiatrin hoito.

Abbreviations

ABA	American Burn Association
APA	American Psychiatric Association
ASD	Acute stress disorder
AUDIT	Alcohol Use Disorders Identification Test
BAI	Beck Anxiety Inventory
BDI	Beck Depression Inventory
BHS	Beck Hopelessness Scale
BPD	Borderline personality disorder
BSS	Beck Scale for Suicidal Ideation
CI	Confidence Interval
CIDI	Composite International Diagnostic Interview
CRH	Corticotropin releasing hormone
DSM	Diagnostic and Statistical Manual of Mental Disorders
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revised
GAF	Global Assessment of Functioning Scale
GMC	General Medical Condition
HPA	Hypothalamic-pituitary-adrenal
ICD	International Classification of Diseases
ICD-10	International Classification of Diseases, 10 th edition
IES	Impact of Event Scale
IES-R	Impact of Event Scale-Revised
MDD	Major depressive disorder
NBR	National Burn Repository
NCS	National Comorbidity Survey
NCS-R	National Comorbidity Survey Replication
NOS	Not otherwise specified
NS	Non significant
OR	Odds Ratio
PD	Personality disorder
PTSD	Post-traumatic stress disorder
SCID	Structured Clinical Interview for DSM-IV
SCID-I	Structured Clinical Interview for DSM-IV Axis I mental disorders
SCID-CV	Structured Clinical Interview for DSM-IV Axis I mental disorders, clinician version

SCID-II	Structured Clinical Interview for DSM-IV Axis II personality disorders
SD	Standard deviation
SNRI	Serotonin-norepinephrine reuptake inhibitor
SPSS	Statistical Package for the Social Sciences for Windows
SSI	Scale for Suicidal Ideation
SSRI	Serotonin-selective reuptake inhibitor
TBSA	Total body surface area
WHO	World Health Organization

List of original publications

This thesis is based on the following original articles referred to in the text by their Roman numerals:

- I Raimo Palmu, Erkki Isometsä, Kirsi Suominen, Jyrki Vuola, Antero Leppävuori, Jouko Lönnqvist: Self-inflicted Burns: An Eight-Year Retrospective Study in Finland. *Burns* 2004; 30, 443-447.
- II Raimo Palmu, Kirsi Suominen, Jyrki Vuola, Erkki Isometsä: Mental disorders among acute burn patients. *Burns* 2010; 36, 1072-1079
- III Raimo Palmu, Kirsi Suominen, Jyrki Vuola, Erkki Isometsä: Mental disorders after burn injury: A prospective study. *Burns* 2010. In Press.
- IV Raimo Palmu, Kirsi Suominen, Jyrki Vuola, Erkki Isometsä: Psychiatric consultation and care after acute burn injury: A six-month naturalistic prospective study.
(Submitted and accepted for publication in General Hospital Psychiatry)

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1 Introduction

In treatment of severe burn injuries with larger areas of the skin destroyed, hospitalization in specialized burn units is required. During the two last decades in Finland, the annual number of patients requiring hospitalization because of their burn injuries has been decreasing from 1300 to 900 patients (Hytönen et al., 1987, Tantula et al., 1997, National Institute for Health and Welfare, 2010). These injuries can be life threatening and devastating. The consequences include fluid and electrolyte imbalance, metabolic disturbances, bacterial contamination of tissues and complications in all major organ systems (Han and Mustoe, 2000, Linares, 2002). The severity of a burn injury is a function of both the characteristics of the burn injury itself and of factors related to the individual, which include the proportion of the body surface burned (TBSA), location of the injury, depth of the injury, age at injury and coexisting illnesses.

The treatment of burns is a long procedure that begins usually on the day of injury and can continue for many years or even decades. Initially, the focus is on the wounds, and surgery is one of the main components of treatment. But even at this early stage other elements affect recovery, the newly healed skin and scars have problems like itching and pain, and psychological stress reflecting in the form of nightmares. As a result of this the patient can feel tired and frustrated (Willebrand et al., 2004b, Low et al., 2006). A lack of tolerance and motivation to comply with the strenuous and painful rehabilitation can all be result of this, requiring a lot of patience from the staff of the burn unit (Low, 2007).

Rehabilitation of the patient starts on the day of the injury. It may comprise a phase of very specialized and technologically focused intensive care but also potential late problems, including complications such as restrictions in range of motion and in muscle strength, changes in appearance, psychological disturbance, and, occasionally, widespread social and environmental dislocation (Fauerbach et al., 2005).

Numerous burn patients are predisposed not only to serious physical injury but also to severe psychological trauma. However, the relationship between burn injuries and mental disorders is complex. Individuals with mental disorders, e.g. substance abuse or dependence are at increased risk for injuries, including burns (Haum et al., 1995). Suicidal patients, who almost always suffer from mental disorders (Beautrais et al., 1996, Suominen et al., 1996), may deliberately burn themselves (Andreasen and Noyes, 1975,

Laloe, 2004). Burn injuries may also predispose to mental disorders. The prevalence of depression is substantially higher among traumatically injured and medically ill patients than in the general population (Bebbington, 2001, Evans et al., 2005, Kessler et al., 2005b). Patients with severe burn injuries are at a high risk for developing especially depressive symptoms or post-traumatic stress disorder (PTSD) (Baur et al., 1998, Thombs et al., 2006, Van Loey et al., 2008). Furthermore, mental disorders, irrespective of the relationship to the injury, can also complicate the acute treatment of burns and rehabilitation (Patterson et al., 1993, Fauerbach et al., 1997, Fauerbach et al., 2005).

2 Review of the literature

2.1 Burns

2.1.1 The definition of burn injury

A burn is the partial or complete destruction of the skin by thermal energy from flames, steam and hot liquids, contact with hot objects, explosion, or electrical current. Injuries to airways or other organs caused by the same mechanisms, and destruction of skin by chemicals or radiation, are also defined as burns (Herndon, 2002).

2.1.2 The function and anatomy of the skin

The skin is the body's largest organ and it is also the largest interface with the surrounding environment. It has many functions; it is a barrier and it protects the body from a multitude of threats from foreign organisms and changes in humidity and temperature in the surroundings. The skin also has an essential sensory function; it enables us to make contact with our surroundings and other humans by conveying sensations such as pressure, textures, and temperatures. Furthermore, the skin fulfils a social, communicative function; it defines our appearance and reflects emotional reactions such as blushing and blanching, and the appearance and symmetry of facial skin have been shown to be determinants of attractiveness (Jones et al., 2004, Low, 2007). The face is also the basis for the first impression of a person's personality. The skin is divided into three layers, of which the epidermis is the outermost, the dermis the next layer and the subcutaneous tissue deepest (Han and Mustoe, 2000).

2.1.3 The evaluation of burn severity

2.1.3.1 The depth of the burned skin

The depth of a burn is described in relation to the anatomical layer that is irreversibly damaged.

Epidermal burns (1st degree burns) are limited to the epidermis, the non-vascularized layer of cells above the basal lamina. *Superficial partial thickness burns* (superficial 2nd degree burns) are limited to the upper layers of the dermis. The blood circulation and the sensory nerves are mainly intact, making these injuries extremely painful. *Deep partial thickness burns* (deep 2nd degree burns) involve deeper layers of the dermis. As these injuries can affect almost the entire dermis, the sensory nerve endings in this layer of the skin are partially damaged and these burns are therefore characterised by decreased sensation in the burned area.

Full thickness burns (3^{rd} degree burns) destroy the entire dermis and therefore require skin grafting. The extent of damage to the subcutaneous tissue or even deeper tissues has a considerable impact on the final appearance.

In both *deep dermal and full thickness burns* wound healing will always be accompanied by scarring and a tendency of scar contracture. The scars are usually red and raised for at least six months until the scar matures, sometimes after several years (Linares, 2002).

2.1.3.2 TBSA - The affected percentage of the total body surface area

(TBSA) is the most common method to evaluate and report burn severity. It is indicating the percentage of burned skin area. Burns with TBSA exceeding 20% are considered severe and life-threatening, generally needing fluid resuscitation and wound therapy in intensive care units.

2.1.3.3 Inhalation burns

Inhaling smoke, flames and heat during a fire can cause a serious injury in the respiratory tract. Inhalation burns are rare but very severe, especially when combined with large burns (TBSA>20%). Inhalation burn significantly increases the mortality (Edelman et al., 2006).

Although widely used as an overall measure of burn severity, the percentage of burned skin area (TBSA) alone is a gross measure of injury severity. Depth of injury (especially the size of full thickness injury), age and existence of inhalation burn injury are very important or necessary additional definitions in evaluating burn severity.

2.1.4 Epidemiology and incidence of burns

A reliable data regarding the true incidence of burns in different countries, especially in the third world seems problematic, but in the modern Western world the incidence of hospital admissions for burns seems comparable. In Canada and the US the incidence range is between 19 and 26/100 000 (Pruitt et al., 2002). In Europe the incidence of hospital admissions because of burns has an even wider range, in the UK approximately 21/100 000 (National Burn Care Review Committee, 2001), in Spain 31/100 000 (Barret et al., 1999), and in Sweden 16/100 000 (Swedish Board of Health and Welfare [Socialstyrelsen], 2005, Low, 2007). In Finland the incidence of burn injuries needing hospital care was 16 to 17 patients/100 000 inhabitants in 2006-2007 (National Institute for Health and Welfare, 2010) which is close to our neighbour country, Sweden. In Finland, during the last two decades there has been a noticeable, clear decreasing tendency, from 1300 patients to 900 patients (in 2006-2007) per year treated in hospital because of burns (Hytönen et al., 1987, Tanttila et al., 1997, National Institute for Health and Welfare, 2010).

Possible reasons for the internationally low figures in Finland and Sweden (Dyster-Aas, 2006, Low, 2007) include well developed legislation focusing on preventive measures, preventive social health care and a fairly even economic standard within the society of these countries.

There is a definite trend toward a decrease in the number of burn injuries over time (ABA, 2007, 2009), and comparisons between different countries and different years should therefore be made with caution. No information is available on the true incidence of burns in low- and middle-income countries, but it appears that the incidence is much higher than in high-income countries (Munster, 1996).

In the National Burn Repository of United States covering ten years of admissions (1995-2005) to Burn Centres in the country (over 126.000 subjects), 70% of the burn patients were men and the mean age was 33 years (Miller et al., 2006). The distribution of gender and age is in line with the results of the Helsinki Burn Centre, Finland (Tanttila et al., 1997, 1998).

Two recently published extensive reviews on the epidemiology of burn injuries highlight cultural and sociodemographic as well as psychiatric and behavioural aspects (Dissanaike and Rahimi, 2009, McKibben et al., 2009). Work-related burns comprise 23% of burn injuries overall (Esselman et al., 2006).

2.1.5 Burns - The treatment and usual complications

2.1.5.1 Burn and the history of its treatment

A burn can be a devastating event in many respects, with long-term physical and psychosocial effects (Gilboa et al., 1994, Van Loey and Van Son, 2003). Major burns are often described as the greatest trauma an individual can sustain. In addition, social consequences such as the loss of family members or friends as well as property and housing can follow. The long, stressful hospitalization required for treatment can lead to social isolation, financial problems and the loss of employment. Even with optimal treatment, scarring is inevitable with deep burns (Monafo and Bessey, 2002), and the appearance and physical function of burn patients will be affected. Furthermore, to enable the burn survivor to attain an acceptable level of functioning, treatment and rehabilitation often continue for many years after injury (Warden and Warner, 2002).

Up until the 1960s only small burns were treated surgically using excision and closure, either by suturing the wounds or by coverage with small skin grafts (Monafo and Bessey, 2002). It was during the 1960s that the combination of introduction of critical care medicine, antibiotic therapy, topical wound therapy and new surgical techniques enabled

the early surgical treatment of larger burns. In this approach the burned tissue is removed before the wound becomes infected, and the clean wound is then immediately covered with skin grafts from uninjured body areas (Janzekovic, 1970). In large burns, where the donor sites do not supply enough skin to cover all wounds in one operation, the un-grafted wounds are protected from infection either by skin substitutes or topical antimicrobial agents until the donor sites are healed and skin can be harvested again. This method reduces the risk for wound infections and sepsis, and has improved survival after burns (Rose and Herndon, 1997, Monafo and Bessey, 2002).

2.1.5.2 Development and outcome of burn treatment

The goal for optimal burn care is to keep the average length of hospital stay below a ratio of one day per percent burned body surface area (Pereira et al., 2004). Although this implies a short length of hospitalisation in smaller burns, it also means that with optimal treatment the length of stay for a patient with a burn of 60% body surface will be two months. During this time the patient will undergo several operations, followed by other painful procedures such as mobilisation, physiotherapy and dressing changes. This phase can be as traumatic as the actual injury (Gilboa et al., 1994).

Advances in surgery and critical care have improved survival following large burns. Whereas a person with a burn of 40% of body surface area had a 50% chance of survival in the early 1970s (Warden and Warner, 2002), this survival rate now applies to an individual with a burn of about 80% of body surface area. However, survival following a major burn is only the first step in a long process of returning to life. More knowledge is needed concerning the long-term outcome after burns, and the risk factors for problems during recovery and rehabilitation. A very recently published, extensive Australian study reports a clinical overview of core outcomes for adult burn survivors (Falder et al., 2009).

2.1.5.3 Physical problems and complications

The deeper the burn, the greater the risk of permanent and visible changes. Even in superficial burns, where surgery and skin grafting is not required, permanent changes can occur in the skin's appearance and quality, and this is always the case in deeper burns (Serghiou et al., 2002).

Scar maturation is accompanied by some degree of contraction; the deeper the damage, the greater the skin's tendency will be to contract (Serghiou et al., 2002). Certain areas of the body have a greater risk of hypertrophic scar formation than others (Preuss et al., 2000). Changes in pigmentation and appearance can occur even if no scars form, and these changes can persist (Poh-Fitzpatrick, 1992). Scars will change the individual's appearance, which can subjectively be experienced as disfigurement (Van Loey and Van Son,

2003). The scars can also lead to a loss of function (Jonsson et al., 1997). Furthermore, in severe cases deep burns can cause the loss of body parts. Up to 87% of burn survivors develop pruritus after burns (Vitale et al., 1991).

2.1.5.4 Mortality

In a global view, burn injury is one of the leading causes of trauma death and among the 30 leading causes of loss of years due to premature mortality and years lived with disability (Murray and López, 1997, WHO, 2007). According to the World Health Organization, fire-related burns were responsible for an estimate of 322.000 deaths in the world in 2002 (WHO, 2002, 2007), and 95% of these deaths occurred in low- and middle-income countries.

Women in South-East Asia have the highest mortality worldwide and in low- and middle-income regions of the Eastern Mediterranean, women also have high rates. On the other hand, high mortality rates also exist among adult men in low- and middle-income regions of Eastern Europe. Children and the elderly (over the age of 70) have the highest rates of mortality while house fires and ignition of clothing having the highest mortality (WHO, 2007).

In Finland, the average annual mortality because of fire is approximately 87 persons (Statistics, 2010). More than half of these persons are under the influence of some intoxicant, mostly alcohol. Approximately 10% of burn deaths in Finland are suicides.

2.2 Mental disorders

2.2.1 Definition of mental disorder

A mental disorder is a clinically significant psychological or behavioural syndrome or pattern that occurs in an individual and is associated with present distress or disability or with a significantly increased risk of suffering death, pain, disability, or an important loss of freedom. In addition, this syndrome or pattern must not be merely an expectable and culturally sanctioned response to a particular event, for example, the death of a loved one. Whatever its original cause, it must currently be considered a manifestation of a behavioural, psychological, or biological dysfunction in the individual (American Psychiatric Association APA, 2000).

2.2.2 Assessing and classification of mental disorders

2.2.2.1 Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised (DSM-IV-TR)

DSM-IV-TR is a text revised form of DSM-IV, a classification of mental disorders in which the diagnoses are categorized. The manual is published by the American Psychiatric Association (APA) (2000). It covers all mental disorders for both children and adults. Disorders are grouped into 16 major diagnostic classes (e.g., Substance-Related, Mood and Anxiety disorders). The DSM uses a multiaxial or multidimensional approach to diagnosis.

Axis I (Clinical Disorders and Other Conditions That May Be a Focus of Clinical Attention) is for reporting all the various disorders or conditions except for the personality disorders and mental retardation.

Axis II (Personality Disorders and Mental retardation) personality disorders are clinical syndromes which have more long-lasting symptoms and encompass the individual's way of interacting with the world. They include e.g. Paranoid, Antisocial and Borderline Personality Disorders. Developmental disorders include autism and mental retardation, disorders which are typically first evident in childhood.

Axis III (General Medical Conditions) is for reporting current general medical conditions that are potentially relevant to the understanding or management of the individual's mental disorder. Physical conditions such as brain injury or HIV/AIDS that can result in symptoms of mental illness are included here.

Axis IV (Psychosocial and Environmental Problems) is for reporting problems that may affect the diagnosis, treatment and the prognosis of mental disorders. Events in a person's life, such as death of a loved one, starting a new job, college, unemployment, and even marriage can impact on the disorders listed in Axis I and II. These events are both listed and rated for this axis.

Axis V (Global Assessment of Functioning) is for reporting the clinician's judgement of the individual's overall level of functioning. The reporting is done using Global Assessment of Functioning (GAF) Scale.

2.2.2.2 The relationship of DSM-IV and ICD-10

In Finland the official classification of diseases is ICD-10 (International Classification of Diseases, tenth edition) developed by World Health Organization (WHO, 1992). It followed the ICD-9 and was published in 1992. In many WHO Member States it came to use from 1994, but in Finland it was from 1996. The ICD is the international standard diagnostic classification for all general epidemiological, many health management purposes and clinical use. All of the diagnostic codes and terms in DSM-IV are fully compatible with both ICD-9-CM (International Classification of Diseases, Ninth Edition, Clinical Modification) and ICD-10. However there are some minor differences (ICD-10 vs. DSM-IV) in these classifications (Andrews et al., 1999, Peters et al., 1999).

2.2.2.3 The Structured Clinical Interview for DSM-IV (SCID)

The Clinician Version of the Structured Clinical Interview for DSM-IV for Axis I mental disorders (SCID-CV) is an adaptation of the SCID, published in 1996 (First et al., 1996), that is intended to introduce the benefits of structured interviewing into clinical settings. The SCID-CV is appropriate for use in a research setting, depending upon the needs of the investigator, especially for studies in which the SCID is used simply to describe the diagnostic characteristics of a sample.

The Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II) was formulated in 1997 and covers all the 10 personality disorders of the DSM-IV, as well as Personality disorder otherwise not specified, Passive-aggressive Personality disorder and Depressive Personality disorder. It follows strictly diagnostic criteria of Axis II Personality Disorders (First et al., 1997). Consequently, there are 12 groups of questions corresponding to the 12 personality disorders. The scoring is equally simple; either the trait is absent, sub-threshold, true, or there is "inadequate information to code".

SCID-II self-questionnaire (comprising 119 questions) is used by most practitioners with the standard test and use the former to screen for true answers in the latter.

2.2.3 Aetiology and mechanisms of mental disorders

Aetiology of mental disorders is multifactorial. Estimates of heritability (Flint et al., 2010) vary depending on the disorder [schizophrenia 81% (Sullivan et al., 2003), bipolar disorder 85-89% (McGuffin et al., 2003, Kieseppä et al., 2004), depression 31-42% (Sullivan et al., 2000) and anxiety disorders 30-40% (Hettema et al., 2001)].

Even if psychiatric disorders do run in families, family, adoption and twin studies have shown that the intergenerational transfer of psychiatric disturbances reflect both genetic and environmental factors and their dynamic interplay. Environmental factors can affect gene expression, and genes in turn have an impact on how an individual reacts and behaves in different environmental conditions. Thus, heritability is conditional to the particular study population and its environmental factors. This has implications for prevention of the intergenerational transfer of psychiatric disorders and underlines the need to reduce environmental stressors in families with parental mental disorder (Paavonen and Solantaus, 2009).

Further, possible neurochemical, neuropeptide and hormonal mediators of the psychobiological response characteristics to extreme stress and adverse life-events have also been identified and related to resilience or vulnerability (Charney, 2004). Psychobiological mechanisms of resilience and vulnerability seem to be important and implications for successful adaptation to extreme stress are needed. The influence of acute stressful life-events seems to be moderated by several mechanisms, e.g. polymorphism in the serotonin transporter (5-HTT) gene (Caspi et al., 2010), corticotropin releasing hormone (CRH) and HPA axis (hypothalamic-pituitary-adrenal axis) and the increased release of e.g. corticotropin, the gender-specific moderation by genes (CRH receptor gene, CRHR1) of neuroendocrine function (Heim et al., 2009). Increased levels of corticotropin releasing hormone (CRH) have been linked to PTSD and depression (Charney, 2004) which can have important clinical implications. More than half of patients with depression have hypersecretion of cortisol and its changes in circadian rhythm. Also the mechanisms of inflammation and immunity in connection to depression and stress seem interesting but the results are partly contradictory. Though, a portion of depressive patients have increased levels of pro-inflammatory cytokines (e.g. TNF and IL-6) which can activate the HPA axis. Also psychosocial stress can raise the levels of cytokines. However, the specificity of the findings of inflammatory factors in relation to stress and depression remains still insufficient although they have been under active research (Irwin and Miller, 2007, Dowlati et al., 2010).

Even if most studies investigating the importance of parental psychiatric morbidity has been in context of maternal psychiatric disorders, paternal disorders seem to be important and different from those associated with maternal disorders, with boys potentially at increased risk (Ramchandani and Psychogiou, 2009, Solantaus and Paavonen, 2009).

Prospectively ascertained child maltreatment is significantly associated with a range of mood, anxiety and substance use disorders, indicating that maltreatment, not just the memory of maltreatment, is associated with subsequent psychopathology (Pirkola et al., 2005a, Green et al., 2010, Scott et al., 2010).

Personality and temperament seem to be important for vulnerability to acute stressful life-events. Personality is defined as "the ingrained pattern of thought, feeling, and behaviour characterising an individual's unique lifestyle and mode of adaptation, and resulting from constitutional factors, development, and social experience" (WHO, 1994). In the trait theories of personality it is assumed that individuals possess broad predispositions, called traits, to respond in particular ways, i.e. personality traits refer to a consistent pattern in the way an individual behaves, feels and thinks. The traits provide a way to summarize how one person differs from another and to make predictions of a person's future behaviour (Pervin and Cervone, 2010). Assessment of various aspects of personality has become increasingly meaningful, since recent research has shown that personality traits are important predictors of health and treatment outcome.

Biologically oriented personality theories tend to use a dimensional approach to classify and explain human behaviour. The three-factor model, proposed by Eysenck, suggests that personality is a hierarchical structure in which a large number of specific traits are organised into three higher-order factors: Extraversion, Neuroticism and Psychoticism (Eysenck and Eysenck, 1964). The five-factor model was developed later (Neuroticism, Extraversion, Openness to experience, Agreeableness and Conscientiousness). The most widely used questionnaire for assessing these is Five-Factor Personality Inventory-Revised (NEO-PI-R) (Costa et al., 1992). In a study of the Finnish general population, neuroticism associated strongly with depressive and anxiety symptoms. In this national study, high neuroticism and possibly low extraversion were predisposing comorbid axis I and II disorders among MDD patients (Jylhä and Isometsä, 2006a, Jylhä et al., 2009). The interrelationship of neuroticism, gender and stressful life-events in the prediction of episodes of MDD was reported in a large population-based American twin study (Kendler et al., 2004).

The term temperament refers to individual differences in general mood or qualities of emotional responses that appear in life, remain fairly stable, are inherited and are based in biological processes (Bates, 2000, Pervin and Cervone, 2010). Cloninger created in 1993 a widely used questionnaire to evaluate the dimensions of temperament (TCI, Temperament Character Inventory)(Cloninger et al., 1993) which was preceded by TPQ (Tridimensional Personality Questionnaires (Cloninger, 1987). The three temperament dimensions in TPQ were: Novelty Seeking (NS), Harm Avoidance (HA) and Reward Dependence (RD) and in TCI character dimensions Self-Directedness, Cooperativeness and Self-Transcendence were added to the scale. Of the TCI-R (Temperament Character Inventory revised) dimensions, High Harm Avoidance correlated with symptoms of depression, anxiety and self-reported lifetime mental disorder in a Finnish nationwide study (Jylhä and Isometsä, 2006b).

Coping is defined as a complex process, "a psychological process that is an ongoing cognitive and behavioural effort to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus, 1993).

2.2.4 The epidemiology of mental disorders

2.2.4.1 Epidemiology of mental disorders worldwide

WHO established World Mental Health (WMH) Survey Consortium in 1998 to investigate prevalences of mental disorders in 14 countries in the Americas, Europe, the Middle East and Africa, and Asia. The instrument for assessing disorders was World Mental Health-Composite International Diagnostic Interview (WMH-CIDI). The prevalence of having any DSM-IV disorders in the prior year varied widely (4.3%-26.4%), Shanghai and the United States with extremes, respectively (Demyttenaere et al., 2004). Anxiety disorders were the most common disorders with prevalence in the range 2.4%-18.2%, followed by mood disorders (0.8%-9.6%), substance-use disorders (0.1%-6.4%) and impulse control disorders (0.0%-6.8%). The United States and Colombia had consistently high prevalence estimates across all classes of disorder.

The Replication of National Comorbidity Survey (NCS-R) was conducted in 2001-2003 in the United States (Kessler et al., 2005b). The 12-month prevalence estimates were anxiety, 18.1%; mood, 9.5%; impulse control, 8.9%; substance-use, 3.8%; and any disorder, 26.2%. Comorbidity was common while 22% had 2, and 23% at least 3 or more diagnoses. Specifically, the prevalence of MDD was 6.7% and PTSD 3.5%. Schizophrenia and other non-affective psychoses were not included in this survey.

A European survey (ESEMeD) from 27 community studies covering 1990-2004 in 16 European (13 EU countries plus Iceland, Norway and Switzerland) countries was conducted (Buist-Bouwman et al., 2008). On the basis of meta-analytic techniques the estimated prevalence of having at least one mental disorder during the past 12 months was 27% among adult population in European Union countries. The most frequent were anxiety (12.0%), mood (9.1%), somatoform (6.3%) and substance dependence disorders (3.4%). Specifically, the 12-month prevalence of depression varied from 3.1% to 10.1 % and for alcohol dependence from 0.1% to 6.6%. Psychotic disorders (2.6%) were included in the survey. The study also showed considerable comorbidity, one third having more than one mental disorder.

2.2.4.2 Epidemiology of mental disorders in Finland

The Health 2000 is a comprehensive health interview and examination survey carried out in the general population of Finland from autumn 2000 to spring 2001 (Aromaa ja Koskinen 2004). This is a recent epidemiologic study on all diseases among inhabitants in Finland. In this survey, 12-month prevalences of CIDI DSM-IV mental disorders were 6.5 % for any depressive (4.9% for MDD), 4.2% for any anxiety and 4.3% for alcohol use disorders (Pirkola et al., 2005b).

A specific study of Health 2000 for psychotic and bipolar disorder (PIF) among adult (30 years) population followed, giving 3.1% to 3.5% lifetime prevalence for any psychotic disorder (Perälä et al., 2007).

In the follow-up study of Health 2000, Mental Health in Early Adulthood (MEAF), 40% of the sample had at least one lifetime Axis I (DSM-IV-TR/SCID-I) disorder. Specifically 17.7% had some depressive (13.8% MDD), 12.6% some anxiety (0.9% PTSD), 14.2% some substance-related disorder. Comorbidity was common while 41% of those with Axis I disorder had at least two disorders. The prevalence of personality disorders was 6.8%. During the last month preceding the interview, 15.3% of the sample had at least one Axis I disorder. Of current (1-month) disorders, substance-related disorders were most common (6.0%), followed by anxiety (5.6%) and depressive disorders (1.8%). Specifically 0.9% had MDD and 0.4% PTSD currently (Suvisaari et al., 2008).

In the national health survey (Mini-Finland) about 20 years earlier, 3.6% of men and 5.5% of women had depression. Neurotic disorders were the most common mental disorders with significant gender difference (10.7% vs. 15.4%) but psychoses occurred in more than 2% of the examinees (Lehtinen et al., 1991).

2.2.5 Treatment of mental disorders

2.2.5.1 Recent guidelines for specific mental disorders

The Finnish Medical Society Duodecim and the Finnish Psychiatric Association have recent Current Care Guidelines for schizophrenia, depression, bipolar disorder, PTSD, borderline personality disorder and sleeping disorders. Working groups for each guideline included specialists of disorders, respectively. These guidelines are based on large research evidence in every specific disorder respectively.

The treatment of depression, as in other disorders, is based on careful diagnostic evaluation. In the acute phase, brief psychotherapies are effective in cases of mild to moderate depression. Antidepressants are also effective. Their importance increases alongside the level of severity. Electroconvulsive therapy (ECT) is effective for severe or psychotic depression after acute phase, antidepressants should be continued for at least six months, maintenance antidepressant treatment should be considered after three lifetime episodes (Finnish Medical Society Duodecim and Finnish Psychiatric Association, 2009b).

Psychosocial support and careful monitoring are recommended for acute stress reaction (ASR) and acute stress disorder (ASD). If symptoms require, short focused cognitive-behavioural psychotherapy can be used for ASD. Sleeping pills can be used for a

short period when necessary. Trauma-focused psychotherapeutic interventions are first-line treatment for post-traumatic stress disorder. SSRI or SNRI antidepressant medication is also effective, antipsychotic and anti-epileptic medication with less evidence. Psychotherapeutic and psychopharmacological interventions can be combined (Finnish Medical Society Duodecim and Finnish Psychiatric Association, 2009a).

A good, long-term therapeutic working alliance is necessary in the treatment of schizophrenia. The integration of different treatments is important. Prevention or diminishment of the symptoms and prevention of new psychotic episodes is the treatment and rehabilitation aim. Antipsychotic medication is effective in the treatment of schizophrenia. Psychosocial treatment and rehabilitation should be integrated with other treatments and chosen according to the patient's individual needs. Psychoeducation, Family psychoeducation and Social skills training have best evidence (Finnish Medical Society Duodecim and Finnish Psychiatric Association, 2008).

A distinguished group of suicidology specialists from different countries reviewed suicide prevention strategies recently. The most promising suicide prevention strategies were physician education, means restriction and gatekeeper education (Mann et al., 2005).

2.2.5.2 Treatment received

Generally, the treatment of mental disorders in Finland is not following the described current care guidelines established which means underused medication, dosage and duration, as well as psychosocial interventions, partly depending on availability and resources.

Use of health services during the past 12 months among patients with MDD, anxiety disorders, or both is small; 34%, 36% and 59% respectively (Hämäläinen et al., 2004, Hämäläinen et al., 2009).

Of Finnish adults 7.1% had used antidepressants in 2000, a third of them had major depressive or anxiety disorder during the previous 12 months. Among antidepressant users, 43% were long-term, 32% intermittent and 26% short-term users. A quarter of all users had no known psychiatric disorder (Sihvo et al., 2008).

Specifically, treatment of MDD seems not good; only one third of subjects with MDD use antidepressants and less than one fifth receives psychological treatment (Hämäläinen et al., 2009).

Also anxiety disorders remain largely untreated in the general population in Finland. Of those with current anxiety disorder, 40% used psychotropic medication, 23% antidepressants, 19% anxiolytics, 17% sedatives or hypnotics. Only 45% reported having psychological treatment (Sihvo et al., 2006).

In Finland, a country with suicide among the leading causes of death for decades, and with an increasing trend from the early 1920s to peak of suicide rate, 30 per 100.000 in 1990, the rate of suicides has been decreasing, and was 18 per 100.000 in 2005. In Finland, a national suicide prevention programme was established in the 1990s (National Research and Development Centre for Welfare and Health, 1993, Lönnqvist, 2009).

2.3 Burns and mental disorders

2.3.1 The relationship of mental disorders and burns

In general trauma and intensive care unit literature mental disorders, like depression and PTSD have been in focus for a long time (Michaels et al., 1999, Zatzick et al., 2007, Davydow et al., 2008). Also the studies comparing burn patients and patients with medical illnesses found higher prevalences of depression in burned patients (Evans et al., 2005, Spijkerman et al., 2005, Rentsch et al., 2007, Fann et al., 2008). A burn trauma exposes the individual to significant physical, psychological and social demands. In follow-ups 14 to 24 months after injury, about 90% of patients report physical complaints, with reactions from scars, pain, pruritus, heat sensitivity and loss of strength being the most common (Taal and Faber, 1998a). One suggested biological mechanism in development of depression and PTSD after stressful events or trauma is the cytokine-induced activation of the HPA axis which has been reported to be a risk marker at least for depression (Capuron et al., 2003).

In many studies of perceived health, psychological health is rated as inferior to physical health (Blades et al., 1982, Salvador Sanz et al., 1998). Even if it is reasonable to expect that patients with major burns are especially at risk, minor burns can result in significant psychological distress (Tedstone et al., 1998). Adaptation after burn injury is a complex process, and the burned area and its localisation can predict perceived outcome to only a small extent (Taal and Faber, 1998b, Kildal et al., 2004). Personality traits (Fauerbach et al., 2000b, Kildal et al., 2004) coping strategies (Willebrand et al., 2002a) and body image dissatisfaction (Fauerbach et al., 2000a) have been reported to be associated with an increased risk for psychological distress following burn injury (Dyster-Aas, 2006). Personality traits have also been shown to be of importance in relation to burn trauma. Persons with high neuroticism and extraversion scores are more likely than others to be exposed to traumatic events (Breslau et al., 1995), and individuals afflicted by burn injury exhibit such personality traits to a greater extent than a normative sample (Fauerbach et al., 2000b, Willebrand et al., 2002b). Furthermore,

personality traits have been suggested to have an important impact on long-term physical and psychological outcome (Gilboa et al., 1999, Willebrand et al., 2002a, Low et al., 2003, Kildal et al., 2004, Willebrand et al., 2006) as well as on the use of health care after burn injury (Wikehult et al., 2005).

In general, "problem focused" coping has been positively associated with health, whereas "avoidant", "self controlling" and "support seeking" strategies have been negatively associated with health (Penley et al., 2002). The findings in the burn literature are somewhat contradictory with regard to problem focused coping and support seeking (Perry et al., 1992, Tedstone et al., 1998), while avoidant coping is more consistently associated with poorer health (Ptacek et al., 1995, Bryant, 1996, Tedstone et al., 1998, Willebrand et al., 2002a, Willebrand et al., 2004a, Kildal et al., 2005).

In a very recent Australian study (Andrews et al., 2010) the impact of personality (NEO-PI-R) (Costa et al., 1992) and coping (Coping with Burns Questionnaire, CBQ) (Willebrand et al., 2002a) on the development of depressive symptoms in adult burn survivors was important while neuroticism significantly predicted depressive symptoms at three-month follow-up and this was significantly mediated by avoidant coping. In addition, extraversion, avoidant coping and approach coping were all significant and independent predictors of depressive symptoms at three months.

2.3.2 Self-inflicted and other intentional burns

Different concepts of suicidality have been variably used. Though, the definitions of suicidal ideation, self-harm, attempted suicide and suicide have been established and are commonly and frequently used. Parasuicide and self-mutilation refer to non-intentional self-harm (Skegg, 2005). In a randomized cross-sectional population-based survey in UK this phenomena was common in general population. A high prevalence (20%) of suicidal ideation was found (Bebbington et al., 2010) and 4.4% of the study population had attempted suicide in their lifetime.

In Finnish general population, 2.4 % of women and 2.3% of men reported suicidal thoughts during the past 12 months. The prevalence of parasuicide was 0.9% and 1.1%, respectively. Further, the overall 12-month incidence of suicidal ideation was 3.8% in follow-up (Hintikka et al., 1998, Hintikka et al., 2001).

In Finland, approximately 900 persons kill themselves annually and during recent years (1998-2008) 9-18 of them are due to self-inflicted burns. On this perspective, the proportion of burn suicides among all suicides seems to be small. On the other hand, suicides comprise approximately 10% of deaths related to fire (Statistics, 2010).

2 Review of the literature

Table 1. The clinical and other characteristics in studies concerning deliberate self-inflicted burns.

Author (reference number)	Area/country	Time period	Cases/all	Per cent	Mean % TBSA	Mean age	Mortality (%)	Females (%)
Andreasen et Noyes 1975 (1)	Iowa/Io/USA	8 y	14/nr	nr	40	42	36	71
Persley 1981(21)	Herston/Australia	1968-79	30/1060	2.8	nr	nr	47	63
Bhaduri 1982 (7)	Manchester/UK	2 y	34/nr	nr	nr	41.5	nr	50
Scullye et al. 1983 (8)	Denver/CO/USA	1978-81	15/164	9	nr	33	33	60
Layton et al. 1983(22)	Pittsburgh/PA/USA	1978-82	11/882	1.2	42.7	37.5	46	55
Davidson et al. 1985(9)	Middlesex/UK	1979-83	42/644	6.5	44	36	48	52
Hammond et al. 1988(2)	Miami/FL/USA	1979-84	33/2357 ^a	1.4	42.8	49.5	57	73
Klasen et al. 1989(10)	Groningen/Holland	1979-87	68/483	14	nr	40.9	21	43
Ben Meir et al. 1990(19)	Beer-Sheeth/Israel	1965-86	22/5934	0.37	79	33.9	77	77
Swenson et al. 1990(20)	La Jolla/CA/USA	1 y	8/nr	nr	25	nr	nr	75
Daniels et al. 1991(11)	Tampa/FL/USA	1980-89	15/2216	0.67	67.3	31.3	53	40
Sonneborn et al. 1992(23)	Essex/UK	1979-91	42/5758	0.7	22	41	28	49
Squyres et al. 1993(12)	Augusta/GA/USA	1988-91	17/1124	1.5	30	38	11.8	41
Sheth et al. 1994(3)	Yorkshire/UK	1983-93	20/234	8.54	44.4	28.8	64.2	85
Garcia-Sanchez et al. 1994(13)	Barcelona/Spain	1983-91	67/3371	1.98	nr	38	29.8	28
Castellani et al. 1995(14)	Verona/Italia	1984-93	31/699	4.4	41	38	38.7	48
Hadjiiski et al. 1996(24)	Sofia/Bulgaria	12 y	89/3975	2.24	nr	nr	34.8	46
Antonowicz et al. 1997(25)	Allentown/PA/USA	1994-95	7/180 ^b	3.9	nr	32	nr	29
Cameron et al. 1997(26)	Queensland/Australia	1990-95	44/1072	4.1	30	31	18	36
Marchesan et al. 1997(4)	Sao Paulo/Brazil	1984-95	82/1069	7.6	52.4	nr	44	71
Krummen et al. 1998(15)	Cleveland/Oh/USA	1978-95	34/3620	1	nr	nr	29	38
O'Donoghue et al. 1998(27)	Cork/Ireland	1984-89	12/260	4.6	30	41	33	58
Erzurum et al. 1999(16)	Pittsburgh/PA/USA	1987-95	11/1135	0.97	26.1	35.7	27.2	36
Mabrouk et al. 1999(5)	Cairo/Egypt	1995-96	23/759	3.45	23	74	nr	91
Wallace et al. 1999(17)	Herston/Australia	1986-96	65/2275	2.9	31.4	nr	21.5	32
Mzezewa et al. 2000(6)	Harare/Zimbabwe	1995-98	47/nr	nr	60	25	68	89
Ho et al. 2001(18)	Hong Kong/China	1993-99	11/1063	1	55	38	36.4	36
Laloe V et al. 2002	Batticalao/Sri Lanka	1999-2001	87/345	25	48	27	70	79
Nakae et al. 2003	Akita/Japan	1996-2001	35/541	6.5	57.6	47.7	54.3	51
Rashid et al. 2004	Birmingham/UK	1979-98	183/7139	2.6	41.1	37.4	44	38
Maghsoudi et al. 2004	Tabriz/Iran	1998-2002	412/	nr	nr	25.5	79.6	99
Mohammadi et al. 2008	Shiraz/Iran	2003-2005	231/931	24.8	33.3	24	62.3	71
Uygur et al. 2009	Istanbul/Turkey	2001-2008	32/800	4	70	25.9	43.4	13
Tahir et al. 2010	Jamshoro/Pakistan	2001-2008	154/1572	9.8	nr	nr	nr	31

a = calculated by the authors

nr = not reported

The worldwide prevalences of deliberate self-burning in different continents and countries were reported in 2004 (Laloe, 2004). In Table 1 studies conducted during 5 decades are summarized, including information of proportion percent, TBSA, age, mortality and gender distribution figures of these patients (Andreasen and Noyes, 1975, Persley and Pegg, 1981, Bhaduri, 1982, Layton and Copeland, 1983, Scully and Hutcherson, 1983, Davidson and Brown, 1985, Hammond et al., 1988, Klasen et al., 1989, Meir et al., 1990, Swenson and Dimsdale, 1990, Daniels et al., 1991, Sonneborn and Vanstraelen, 1992, Squyres et al., 1993, Garcia-Sanchez et al., 1994, Sheth et al., 1994, Castellani et al., 1995, Hadjiiski and Todorov, 1996, Antonowicz et al., 1997, Cameron et al., 1997, Marchesan et al., 1997, Krummen et al., 1998, O'Donoghue et al., 1998, Erzurum and Varcellotti, 1999, Mabrouk et al., 1999, Wallace and Pegg, 1999, Mzezewa et al., 2000, Ho and Ying, 2001, Laloe, 2002, Nakae et al., 2003, Maghsoudi et al., 2004, Rashid and Gowar, 2004, Mohammadi et al., 2008, Uygur et al., 2009, Tahir et al., 2010). In this Table, a large variation from one study to another in characteristics of patients with self-inflicted burns is present. The most common method of burns among self-inflicted burns has been flame, but the literature is inconsistent regarding the gender distribution which seems to vary lot because of cultural differences, affecting the male-female-ratio. For example, there is a marked preponderance of female patients of Latin, Asian or Arabian origin in some studies (Table 1). Although a history of psychiatric illness is common among patients with self-inflicted burns, the exact type of mental disorders and potentials for prevention have been not sufficiently investigated.

However, in a recent German follow-up study of self-inflicted burn patients psychiatric disorders were investigated with structured clinical interview (SCID-I and SCID-II). Only 27 of all 46 self-inflicted patients survived. Psychiatric disorders were investigated of 11 (24% of all) self-inflicted patients. At the time of the burn incident three patients had bipolar disorder, one MDD, one Obsessive-compulsive disorder (OCD), one social phobia, one PTSD, one unspecified anxiety disorder and one psychosis. The criteria of substance abuse were fulfilled for alcohol (N=3), sedatives (N=2), cannabis (N=3) and hallucinogens (N=1) at the time of incident but only one patient was still addicted to alcohol at follow-up. All but one patient had at least one personality disorder; antisocial, borderline, paranoid and obsessive-compulsive personality disorders most often diagnosed (Daigeler et al., 2009).

In another recent, case-control study of psychiatric disorders among self-inflicted patients in Iran, 67% had Axis I (DSM-IV) adjustment disorder, 10% drug and alcohol abuse or dependence, 3% major depression and 7% dysthymia. Of Axis II personality disorders, borderline (1%) and antisocial (3%) personalities were diagnosed (Ahmadi et al., 2010).

In a recent comparative study from the same country self-immolation patients perceived significantly lower quality of personnel care compared with those with unintentional burns (Zargoushi et al., 2010).

Intentional burns can be caused by an individual themselves or another person (Greenbaum et al., 2004). In the United States (NBR analysis) one half of intentional burns were suicidal and the other half assaulted (Modjarrad et al., 2007). In UK, among the self-inflicted burn patients various psychiatric history was much more common than among the assaulted burn patients (62.8% vs. 12.2%) (Malic et al., 2007). In a prospective survey of intentional self-mutilation in forensic environment conducted recently in Iran showed that burns comprise 3.4% of all types of self-mutilation (Taghaddosinejad et al., 2009).

2.3.3. Mental disorders before burn injury

The prevalence of psychiatric disorders before burn injury has been reported to be 28% to 75% (Patterson et al., 1993). In a study from 2003, Patterson et al. (Patterson et al., 2003) observed that burn patients had higher psychological distress than a non-burned normative sample, even after excluding those with a formal pre-injury psychiatric diagnosis. In two studies by Fauerbach and colleagues (Fauerbach et al., 1996, Fauerbach et al., 1997), the lifetime prevalence for any DSM-III-R axis I diagnosis was 64%, for affective disorder it was 31 %, and for alcohol abuse or dependence it was 41%. Compared to population-based figures obtained in the same time period, an American epidemiological study (Kessler et al., 1994), where the lifetime prevalences for any psychiatric disorder were 48%, for depression 17% and for alcohol abuse or dependence they were 24% (Dyster-Aas, 2006). The replication of the American population-based study showed prevalences of 46% for any psychiatric disorder (Kessler et al., 2005a).

In a recent study of Swedish burn patients Dyster-Aas et al. found that 66% of the individuals had at least one lifetime psychiatric diagnosis; the prevalence was 41% for major depression and 32% for alcohol abuse/dependence (Dyster-Aas et al., 2008).

In many patients with pre-injury psychiatric disorders, it seems that the disorder in question can contribute significantly to the aetiology of the injury itself (Noyes et al., 1979, Rockwell et al., 1988, Powers et al., 2000). Furthermore, patients with a pre-injury psychiatric history are more likely to have preventable injuries, require longer hospitalization and have problems with adjustment early in their recovery (Tucker, 1987, Patterson et al., 1993, Tarrier et al., 2005).

2.3.4 Mental disorders after burn injury

Studies investigating the prevalence of post-burn mental disorders and problems in different phases of adjustment after burn have existed since the early 1970s (Andreasen et al., 1971, Andreasen and Norris, 1972, Andreasen et al., 1972a, Andreasen et al., 1972b). During acute care in hospital immediately after the burn injury, cognitive changes such as delirium and transient psychotic reactions may occur (Blank and Perry, 1984, Patterson et al., 1993).

Individuals who sustain a burn injury have often pre-burn mental disorders, which makes them more vulnerable to post-burn psychiatric problems (Van Loey and Van Son, 2003). Psychological responses to the burn trauma itself, extreme pain, isolation during acute treatment and alteration in body appearance and limitations in physical functioning can form a risk for pathological psychological responses and psychiatric disorders (Ulmer, 1997, Pallua et al., 2003, Van Loey and Van Son, 2003).

In two comprehensive reviews of the literature ((Malt 1980)) (Patterson et al., 1993), anxiety and depression were the most prevalent disturbances in burn patients at follow-up. It was found that symptoms of depression and anxiety generally occurred together, with prevalence rates between 25% and 65% one year post-burn, and that most symptoms subsided after that period (Patterson et al., 1993). Later in 2003 van Loey reviewed comprehensively epidemiology and management of psychopathology and psychological problems in burn patients (Van Loey and Van Son, 2003). In this survey details of all studies for depression and PTSD, using structural interview, SCID or other, were listed.

2.3.4.1 Depression

In studies published after 1990 and using self-report instruments, depression prevalence rates vary between 2% (Tedstone and Tarrier, 1997) and 53% (Wiechman et al., 2001) the first month after the burn, and between 13 % (Williams and Griffiths, 1991) and 34% (Wiechman et al., 2001) at 12 months post-burn. Only a limited number of studies have used clinician-administered semi-structured interviews. In a study from the US by Fauerbach et al. (Fauerbach et al., 1997), the Structured Clinical Interview for DSM-III-R psychiatric disorders (SCID-I) was utilised to diagnose major depression. At the time of discharge from hospital four out of 95 patients (4%) were diagnosed with an ongoing major depression. Of those 49 patients who remained in the study at the 12-month follow-up, five (11%) fulfilled major depression criteria. In a similar study of 45 burn patients in Greece (Madianos et al., 2001), 16% were diagnosed with a mood disorder during hospitalization and 20 % at the 12-month follow-up. However, both studies suffered from high attrition rates (Dyster-Aas, 2006).

A number of possible risk factors for post-burn depression have been examined with conflicting results, probably as a result of poor statistical power (Van Loey and Van Son, 2003). Premorbid psychopathology was not related to symptoms of depression in the studies by Tedstone et al. (Tedstone et al., 1998) and Williams and Griffiths (Williams and Griffiths, 1991), whereas Fauerbach et al. (Fauerbach et al., 1997) reported that pre-burn affective disorder was significantly related to post-burn affective disorder. The latter is in agreement with general trauma literature (Shalev et al., 1998, Dyster-Aas, 2006). The impact of personality and coping on the development of depression symptoms among Australian adult burn patients was reported recently (Andrews et al., 2010).

Inconsistencies have also been reported with respect to the role of burn severity and locus of burn (Dyster-Aas, 2006). The extent of physical injury seems to be of minor importance (Williams and Griffiths, 1991, Wiechman et al., 2001). However, when patients with premorbid psychopathology were excluded, one study reported that the presence of physical injury was the single best predictor for development of depression in a mixed sample of burn and motor vehicle accident patients (Maes et al., 2000). In the previously mentioned study by Madianos et al. (Madianos et al., 2001), face disfigurement was significantly associated with the presence of psychiatric morbidity, at least during acute hospitalization. In a study of psychosocial adjustment five years after burn injury, significantly more patients with disfigurement on the hands or face reported symptoms of depression as compared to those with no visible burns (Pallua et al., 2003).

2.3.4.2 Post-traumatic stress disorder

PTSD is classified as one of the anxiety disorders in the DSM (Diagnostic and Statistical Manual of Mental Disorders), but differs from other anxiety disorders in that it has to be preceded by a traumatic event and that exposure to the traumatic event has to involve a threat to life or physical integrity (American Psychiatric Association APA, 2000). It also has to include a moment of intense fear or helplessness. Subsequently, the affected individual must suffer symptoms of intrusion and display avoidant behaviour and hyperarousal. These symptoms must cause substantial subjective distress or functional impairment for at least four weeks.

Lately, the term sub-threshold or partial PTSD has been used in order to fully cover those individuals who suffer from post-traumatic symptomatology, but without fulfilling all necessary criteria for full PTSD (Dyster-Aas, 2006). The reason for this is based on criticism that the PTSD concept is too restrictive, since a number of individuals who do not fulfil diagnostic criteria for full PTSD will exhibit clinically significant levels of impairment (Mylle and Maes, 2004). It has also been suggested that individuals who at one point exhibit some but not all criteria for PTSD are at risk for later development of a complete PTSD (Cartt et al., 2006).

Acute stress disorder (ASD) was introduced into the DSM-IV in 1994 (American Psychiatric Association APA, 2000). The diagnostic criteria for ASD have much in common with the criteria for PTSD. Though the criteria for ASD contain a greater emphasis on dissociative symptoms and ASD can be diagnosed only within the first month after a traumatic event. The inclusion of ASD in the DSM-IV was not introduced through extensive research like PTSD (Dyster-Aas, 2006). Thus, debate exists regarding whether the diagnostic criteria accurately reflect pathological reactions to trauma that occur within the first month after a trauma (Bryant and Harvey, 2000). On the other hand, in an American burn centre (New York) structured interviews (SCID) were combined with self-report measures Impact of Event Scale (IES) within 2 weeks of injury and 6 months post-burn showing that acutely hospitalized burn patients with ASD are at high risk for chronic PTSD (Difede et al., 2002).

Many studies have focused on PTSD in burn populations since specific diagnostic criteria were included in the DSM-III (Dyster-Aas, 2006). In a critical review by Baur (Baur et al., 1998) comprising studies between 1986 and 1996, the prevalence rates of PTSD in adult burn populations varied between 31% and 45%. In more recent studies using self-report instruments, frequencies vary between 2% (Tedstone and Tarrier, 1997) and 26% (Van Loey et al., 2003) within the first month post burn and between 13% (Williams and Griffiths, 1991) and 33% (Taal and Faber, 1998a) at the 12-month follow-up.

By using the SCID-I methodology for diagnosing of PTSD, Fauerbach et al. (Fauerbach et al., 1997) reported a prevalence of 8% at discharge from hospital and 20% at the 12-month follow-up. Similar findings were obtained from the study by Madianos (Madianos et al., 2001) who reported a prevalence rate of 18% within the first month post-burn and 20% at the 12-month follow-up.

The prevalence for sub-threshold PTSD after burn injury is naturally higher than those reported for full PTSD (Patterson et al., 1990, Fauerbach et al., 2000b, Dyster-Aas, 2006).

A high comorbidity between PTSD and depression has been described both in burn patients and other trauma populations (Kessler et al., 1995, Maes et al., 2000, O'Donnell et al., 2004), and the question whether PTSD and depression are separate disorders in the aftermath of trauma or part of a single general traumatic stress construct still exists unsolved (O'Donnell et al., 2004).

The risk factors for developing PTSD after a burn injury have been addressed by several studies (Dyster-Aas, 2006). Fauerbach et al. (Fauerbach et al., 1997) found that pre-burn affective disorder, but not anxiety disorders, increased the risk of post-burn PTSD, whereas Perry et al. (Perry et al., 1992) reported that subjective emotional distress and perceived social support after injury were related to the development of PTSD. In a study

by van Loey et al. (Van Loey et al., 2003), PTSD symptoms were predicted by anxiety measures and objective factors such as female gender, locus, and severity of injury. In another study, cosmetic disfigurement was related to the manifestation of PTSD symptoms of avoidance and emotional numbing in female patients with burn injuries (Fukunishi, 1998, 1999). Furthermore, personality traits have been related to PTSD after burn. A study by Fauerbach et al. (Fauerbach et al., 2000b) indicated that neuroticism was higher and extraversion was lower in patients who developed PTSD compared with those who did not develop PTSD. In addition, a study of the Swedish research group from Uppsala Burn Unit revealed that coping style, life threat during the accident, and early symptoms appeared to be strong predictors of PTSD symptoms at three months after burn injury (Willebrand et al., 2004a).

Finally, screening for nightmares seems to be a simple tool to identify individuals at high risk of having PTSD symptomatology (Low et al., 2006). On the other hand screening of anxiety and especially PTSD symptoms was repeatedly reported to be important because of their tendency to correlate with subjective pain (Visual analogue scale, VAS) usually having a remarkable influence on the acute treatment of burns (Difede et al., 1997, Taal and Faber, 1997b, a).

2.3.4.3 Other Axis I disorders

Substance-related disorders have been commonly connected with traumas and accidents. The literature about alcohol and substance use/dependence among burn patients exists in form of e.g. detection of alcohol/substance through blood analyses, questionnaires of usage history, risk factor analyses as well as treatment complications and mortality comparison with other burn patients (Thal et al., 1985, Howland and Hingson, 1987, Swenson et al., 1991, Bernstein et al., 1992, Kelley and Lynch, 1992, Powers et al., 1994, Steenkamp et al., 1994, Haum et al., 1995, Barillo and Goode, 1996, Grobmyer et al., 1996, Tabares and Peck, 1997). However, comprehensive diagnostic studies with structured interview are scarce, showing lifetime pre-burn prevalences of 41% and post-burn (12 months) of 11% for alcohol use or dependence in American (Fauerbach et al., 1997) and 32% for lifetime and 6% for post-burn (12 months) in Scandinavian burn patients (Dyster-Aas et al., 2008). The lifetime prevalences for substance or dependence for American and Scandinavian burn subjects were 24% vs. 6%. Both studies used SCID for diagnosis of mental disorders.

Disorders due to General Medical Condition (GMC) are present mostly during the immediate post-burn phase, cognitive changes such as delirium and transient psychotic reactions may occur, usually as a result of infections, alcohol withdrawal, metabolic complications, or high doses of drugs (Patterson et al., 1993). DSM-III criteria fulfilling diagnosis of

delirium was present in 18%, and 24% had at least one criterion symptom of delirium in a prospective study in an American burn centre (Blank and Perry, 1984). After delirium resolved, seven of 25 survivors (28%) had severe psychological symptoms; either depression or PTSD as an outcome.

Psychosis in burned patients seems to have been even less systematically studied (Quindlen and Abram, 1969, Patterson et al., 1993, Fauerbach et al., 1997).

2.3.4.4. Axis II personality disorders

Studies with structural interview of personality disorders (e.g. SCID-II) among burn patients were not found except in the aforementioned recent German and Iranian studies of self-inflicted burns (Daigeler et al., 2009, Ahmadi et al., 2010). However, the Swedish colleagues reported in the 11th Congress of European Burn Association 2005 a prevalence of 27% for any DSM-IV (SCID-II) personality disorder among acute burn patients, combined with a significantly higher rate of other lifetime mental disorder (94% vs. 52%) and incidence of self-inflicted burns (28% vs. 8%) as compared to those without a personality disorder (Ekselius et al., 2005).

2.3.5 Post-burn psychiatric evaluation and psychiatric care

Overall, the literature of comprehensive psychiatric evaluation of mental disorders or symptoms and studies over specific psychiatric treatments seems scarce. However, in a large European survey, in almost half of the European hospitals less than 20% of the patients and 41% of the hospitals assessed the patient's emotional health on some occasions. Nevertheless, 75% of European respondents were convinced that 6 months after the burn injury, about 2 out of 3 patients, of having a hard time dealing with the psychological consequences; only 6% of European burn patients meet a psychologist or psychiatrist after discharge from hospital (Van Loey et al., 2001).

Relatively few studies have been published on post-burn contact to psychiatric services, or on psychiatric care (Van Loey and Van Son, 2003). Studies in the US, and Canada (Holaday and Yarbrough, 1996) and also in Europe (Van Loey et al., 2001) show that at least psychological assessment and/or psychological care are often not provided in burn units or at least they are frequently not adequately as an integral part of the treatment plan (Wisely and Tarrier, 2001). One quarter of American, and half of European burn units, reported that less than 20% of acute care patients received psychological counselling or therapy after burn (Van Loey and Van Son, 2003).

In a Spanish study of 65 burn patients who were in psychiatric consultation it was reported that PTSD is easily missed by the medical staff of burn units (Perez Jimenez et al., 1994).

No systematic studies of psychopharmacological treatment of burn patients with mental disorders were found, but a few studies of psychological treatments in burn patients are available and also experimental studies with tricyclic antidepressants in treatment of PTSD exist already from the 1980s (Blake, 1986). Later, in 1994, imipramine was used to treat ASD in American pediatric patients with acute burns. This intervention decreased hyperarousal and intrusive re-experiencing symptoms of ASD (Robert et al., 1999).

From general trauma literature, it is concluded that cognitive (behavioural) and pharmacological (selective serotonin reuptake inhibitors, SSRI) interventions have a positive effect on depression. With respect to PTSD, exposure therapy and eye movement reprocessing and desensitization are successful (Van Loey and Van Son, 2003). Psychological debriefing aiming to prevent chronic post-trauma reactions has not, thus far, shown a positive effect in burn patients. A randomized controlled trial on acute, immediate crisis intervention (debriefing) among burn patients showed a detrimental effect (Bisson et al., 1997). Treatment of problems in the social area includes cognitive-behavioural therapy, social skills training, and community interventions (Van Loey and Van Son, 2003). In addition to psychopharmacological treatment of comorbid pain and anxiety of burned patients psychological interventions have been studied and promising results of music therapy and relaxation have been reported (Patterson, 1992, Haythronthwaite et al., 2001, Prensner et al., 2001, Ferguson and Voll, 2004).

In a recent Swedish study using structured clinical interviews for evaluating mental disorders (Dyster-Aas et al., 2008), they found among acute consecutive burn patients that 42% of the subjects in one-year follow-up received antidepressant drugs or psychological treatment. The treatment was significantly more common among those who fulfilled criteria for a mental disorder (SCID-CV) during the last 12 months before the burn.

The role and functions of the psychiatrist in team treatment of burned patients seem most effective when the psychiatrist is able to participate on a regular basis in the care of every patient as a member of the burn team (Goodstein and Hurwitz, 1975, Watkins et al., 1992).

Overall, it seems likely that the specific mental disorder and its severity should determine the specific psychiatric treatment, rather than the burn injury itself.

3 Aims of the study

This study aims to investigate the prevalence of mental disorders and suicidality among burn patients as well as the psychiatric consultation and care which they receive.

The study consists of four original publications, the aims of which were:

- I.** To investigate differences in characteristics of burn patients who had attempted suicide, as compared with other burn patients
- II.** To comprehensively investigate the prevalence of mental disorders among acute hospitalized adult burn patients, evaluated in three time frames: lifetime before burn, one month prior to burn, and during acute care immediately after burn.
- III.** To prospectively investigate variations in prevalences of mental disorders after burn injury, and correlation between burn severity and mental disorders among hospitalized burn patients.
- IV.** To prospectively investigate proportion of burn patients receiving psychiatric consultation or/and care, whether estimated need relates to care actually received, or burn severity correlates with received care after burn.

4 Materials and methods

In Finland, population 5.3 million, during last decades, approximately 1000 burn patients have required hospitalization annually (Hytönen et al., 1987, Tanttula et al., 1997, National Institute for Health and Welfare, 2010). There are presently two university hospitals (in Helsinki and Kuopio) with burn units, the intention being to concentrate the severely burned patients in these two units (Papp et al., 2001). However, the most severe burns are treated at the Helsinki University Central Hospital. Thus, the catchment area of this study comprises the whole of Finland.

The present thesis consists of two cohorts. The first of them consists of all burn patients (N=811) admitted to Helsinki Burn Centre between 1st January 1989 and 13th July 1997.

The second cohort consists of all consecutive adult acute burn patients (N=156) admitted to the Helsinki Burn Centre between 1st May 2006 and 31st October 2007.

4.1 The cohort of self-inflicted burn patients and controls

4.1.1 Patients and controls

The computerised register of burn patients at the Helsinki Burn Centre began operating on 1st January 1989 and includes all burn patients, self-inflicted and others, treated in the burn unit. The register includes information on e.g. age, TBSA, working status and type of burn. The present study included all patients admitted between 1st January 1989 and 13th July 1997, a total of 811 patients.

4.1.2 Procedure (study method)

Those who had attempted suicide were identified from the medical records. The classification was made by the principal investigator (RP), an experienced psychiatrist who went through medical records of all burn patients included in the cohort (N=811) but did not investigate or interview any of the subjects personally face-to-face. Cases in which the classification was difficult due to conflicting information were resolved in

consensus discussions involving three psychiatrists (RP, KS and EI). Only cases with explicit evidence for deliberate self-harm were classified as suicide attempters. Suicide attempters were compared with the other burn patients (controls) in the cohort. Death rate was calculated based on register information.

The study protocol was approved by the Ethics Committee of Helsinki University Central Hospital.

4.2 The cohort of acute hospitalized burn patients

4.2.1 Patients

4.2.1.1 Baseline

All consecutive adult acute burn patients admitted to the Helsinki Burn Centre from 1st May 2006 to 31st October 2007 were eligible for this study. Finnish speaking patients who were at least 18 years old (N=156) were included. However, of the 156 acute burn patients, 19 (12.1%) died; these cases included five (3.2%) suicides. Ten patients (6.4%) were transferred to another hospital after immediate care at the Burn Centre, most of them requiring special intensive care, and could not be interviewed. Altogether 18 patients (11.5%) were excluded because of poor understanding of Finnish or poor cognitive or sensory capacity (high age, dementia, brain damage or deafness). One patient refused to participate in the study, and another withdrew consent after the first interview. Thus, of the 156 consecutive acute burn patients, 107 (68.6% of total sample) participated. The study protocol was approved by the Ethics Committee of Helsinki University Central Hospital.

4.2.1.2 Follow-up

After baseline, 92 of the 107 patients (86% of the study cohort) were interviewed a second time at six months by the same experienced psychiatrist as at baseline, 84/ 106 (79.2%) of them face-to-face and 8/ 106 (7.5%) patients personally by telephone. One of the missing 15 patients was known to have died, and 6 patients (5.6%) refused to participate in the follow-up interview.

Patients who dropped out (N=15) during follow-up did not differ significantly from interviewed subjects (N=92) in gender, age, civil or working status, TBSA, or pre-burn psychiatric hospitalization. However, they more often had a history of suicidal acts (33.3% vs. 9.8%, p=0.012) before burn than participants. The prevalence of Axis I mental disorders during the final month preceding burn was also significantly higher among

non-participants than participants (66.7% vs. 35.9%, $p=0.024$), and they also more often had borderline personality disorder (40.0% vs. 10.9%, $p=0.03$). There existed also similar non-significant trends in prevalences of lifetime substance-related disorders (66.7% vs. 43.5%, $p=0.095$) and overall personality disorders (40.0% vs. 20.7%, $p=0.101$). Thus, subjects dropping out from follow-up suffered from more severe psychopathology than those remaining in the study.

4.2.2 Procedure (study method)

An experienced psychiatrist (RP) interviewed all of the consecutive acute burn patients admitted to Helsinki Burn Centre. The patients were approached concerning participation in the study as soon as their medical condition was sufficient to provide informed consent. Some patients were still in intensive care at the time of the interview. The median time between injury and first interview was 13.8 days (SD 35.1 days). The mean time between the burn injury and the second interview (follow-up) was 230.64 (SD 90.81) days, and between the first and second interview, 215.47 (SD 94.49) days.

At baseline, information on sociodemographic factors, earlier diseases, treatment of the patient and details of the burn incident itself was widely gathered from patient records and by interviews using a study form planned specifically for this study, in means of gathering anamnesis (see Appendix 1). At the follow-up, information also on received psychiatric consultation and care, coping, disability, quality of life and suicidality was gathered.

4.2.3 Measures and definitions

4.2.3.1 SCID-I and SCID-II

At baseline, the Clinician Version of the Structured Clinical Interview for DSM-IV (SCID-CV)(First et al., 1996) was used to diagnose Axis I mental disorders. Patients were mostly interviewed on two separate occasions. Axis I diagnoses were assessed for a) lifetime (including final month) prior to burn, b) the month prior to burn, and c) during acute care in hospital. SCID-II (First et al., 1997) was used to diagnose Axis II disorders (personality disorders); 104 patients (97.2%) were interviewed with SCID-II. The patient first filled out the SCID-II screen and other self-report measures, usually before the second appointment. The total time spent in interviews varied between one and 1.5 hours.

At the follow-up interview, SCID-CV, but not SCID-II, was repeated to diagnose Axis I mental disorders a) during the six months after the burn and b) during the last month before the second interview. Self-reported measures were mostly obtained one day before the second interview.

4.2.3.2 Self-reported questionnaires at baseline and follow-up

The patient filled the following self-report questionnaires of different psychological symptoms 1.7 days (=mean time; SD 7.3 days; median 0 days) after the first baseline interview:

Beck Depression Inventory (BDI) (Beck et al., 1961). The BDI is a self-report 21-item scale used to assess the current severity of depression. Each item is rated on a four-point scale (0 to 3) with possible total scores ranging from 0 to 63. Scores provide a measure of the severity of self-reported depression: 0-9 minimal, 10-16 mild, 17-29 moderate, and 30-63 severe.

Beck Anxiety Inventory (BAI) (Beck et al., 1988). The BAI is a self-report 21-item scale that measures the symptoms of anxiety that are largely independent of depression. Each symptom is rated on a four-point scale (0 to 3) with possible total scores ranging from 0 to 63. Scores provide a measure of the severity of self-reported anxiety: 0-7 minimal, 8-15 mild, 16-25 moderate, and 26-63 severe.

Beck Hopelessness Scale (BHS) (Beck et al., 1974). The BHS consists of 20 true-false statements that measure the degree of pessimism and negativity about the future. Keyed responses are summed to give a score of 0 to 20. Scores provide a measure of the severity of self-reported hopelessness: 0-3 minimal, 4-8 mild, 9-14 moderate, and 15-20 severe.

Beck Scale for Suicidal Ideation (BSS/SSI) (Beck et al., 1979). The BSS is a self-report 19-item scale preceded by five screening items. The BSS and its screening items are intended to assess a patient's thoughts, plans and intent to commit suicide. All 24 items are rated on a three-point scale (0 to 2). In this study, scores from the five screening items were included in the overall score. Therefore, total scores could range from 0 to 48. No specific cut-off scores exist to classify severity or guide patient management. Increasing scores reflect greater suicide risk, and any positive response merits investigation.

Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993). The AUDIT is a 10-item scale designed to identify individuals with hazardous and harmful drinking. This instrument assesses alcohol intake (items 1-3), dependence (items 4-6) and adverse consequences associated with alcohol use (items 7-10). Respondents score between 0 and 4 on each item, with AUDIT scores found by summing responses to each item. AUDIT scores, therefore, range from zero to 40, with higher scores indicating more severe problems. Drinking is considered hazardous if AUDIT score is ≥ 7 .

At the end of follow-up, measures of depression (BDI), anxiety (BAI), hopelessness (BHS), suicidal ideation (SSI) and alcohol consumption (AUDIT) were repeated.

4.2.3.3 Self-reported questionnaires only at follow-up (6 months)

Besides diagnosing PTSD at the SCID-CV interview, altogether 80 patients (87%) also filled out IES-R at the end of follow-up.

Self-report of post-trauma stress - Impact of Event Scale-Revised (IES-R) (Weiss and Marmar, 1997) comprises 22 items in three subscales (eight intrusion items, eight avoidance items and six hyperarousal items). Respondents are asked to rate each item on a scale of 0-4 (0=not at all, 1=a little bit, 2=moderately, 3=quite a bit, and 4=extremely) according to how distressing each difficulty was during the past seven days. Total score on IES-R ranges between 0 and 88 (Horowitz et al., 1979, Weiss and Marmar, 1997). PTSD is a clinical concern if total score is >23 when evaluating risk for full or partial PTSD or at least some of the symptoms (Asukai et al., 2002, Creamer et al., 2003).

4.2.3.4 Suicide attempt

Suicide attempt (burn or other) was defined as self-injurious behaviour with a non-fatal outcome accompanied by evidence (either explicit or implicit) that the person intended to die (APA, 2003).

4.2.3.5 TBSA - severity of the burn injury

Severity of burn injury was evaluated in terms of total body surface area (TBSA), indicating the percentage of burned skin area. Burns with TBSA exceeding 20% are considered severe, generally needing fluid resuscitation and wound therapy in intensive care units.

4.2.4 Psychiatric consultation and care during follow-up

4.2.4.1 Contact to psychiatric services after burn injury

The information on psychiatric consultation and psychiatric care received during follow-up was based both on the interview at six months, and medical records since the burn. Psychiatric consultation was classified as one type of contact to psychiatric services, but not included as psychiatric care. The different levels of psychiatric care were classified as 1) crisis intervention by psychiatric consultation-liaison nurse, 2) psychiatric outpatient care and 3) inpatient care in psychiatric department. Out- or inpatient care in substance use services are distinct from psychiatric care, and are therefore not included as psychiatric care.

Even if making the referral, the plastic surgeon in the Burn Unit was not solely responsible for the decision considering the need for psychiatric consultation or crisis intervention. A multidisciplinary burn team has existed at the Helsinki Burn Centre since the unit was founded in 1989. It is among the most long-term liaison psychiatric services within the Helsinki University Central Hospital. The burn team meets once a week in the Burn Centre to discuss various clinical problems related mainly to acute treatment. The team comprises a psychiatrist, a psychiatric nurse and the multidisciplinary staff of the Burn Unit. The psychiatric nurse is responsible for the crisis interventions (1 to 4 bedside appointments) during acute care. The psychiatric out- or inpatient care after acute treatment in Burn Unit can include immediate continuation of earlier treatment in psychiatric institutions, or a referral.

4.2.4.2 Specific psychiatric treatment

Information on specific interventions during follow-up and ongoing psychiatric care at the end of follow-up was also gathered. Among *psychotherapeutic treatment*, psychotherapy was defined as a regular, at least weekly therapeutic treatment provided by a certified psychotherapist with relevant training. Any unspecified psychological or psychosocial treatment given by a professional was considered as psychotherapeutic support but not as psychotherapy proper. Also included were regular care at substance use outpatient clinics, and regular visits to general practitioner involving supportive psychosocial interventions as psychotherapeutic support.

All information on specific *psychopharmacological treatment* (antidepressants, antipsychotics, mood-stabilizers or other psychotropic drugs) received during follow-up was gathered, regardless of the indication (mental or other disorder). Other psychotropic drugs included: 1. benzodiazepines, 2. hypnotics and 3. other drugs not mentioned above, but having psychotropic effect. The dose, duration or timing of the specific psychotropic drugs were not investigated because information found in medical records was not exact and extensive enough.

4.2.4.3 Need for psychiatric care

The need for psychiatric care was classified into three categories: 1) unequivocal need, 2) probable need and 3) no need for psychiatric care.

In the first category included were patients with psychotic, major depressive (MDD) and post-traumatic stress disorders (PTSD) during follow-up. The patients who had attempted suicide by burning themselves were also included in this group. The received psychiatric care and specific treatments (psychotherapeutic treatment and psychotropic pharmacotherapy) were investigated of these four subgroups in the first category. In the second (probable need) category were included the remaining patients with at least one Axis I or II mental disorder. In the third (no need) category, patients had no diagnosable mental disorder during the six post-burn months.

4.2.5 Statistical methods

The data were analysed with SPSS 10.1 and 16.0 software. Chi-square test, two-sample t-test and Mann-Whitney U-test (for non-parametric variables such as TBSA) as well as Cochran Q-test, Wilcoxon signed-rank test, McNemar pairing test and Spearman correlations were used when appropriate. Binomial and multinomial logistic regression models were applied to control for confounding factors and to examine the relationship between level of burn severity (exposure) and mental disorders in follow-up. Binomial logistic regression model was also used to examine the relationship between level of burn severity, pre-burn psychiatric treatment, need for psychiatric care and received psychiatric care during follow-up. The level of burn severity was described in ascending TBSA classes.

5 Results

5.1 Self-inflicted burn patients and controls (study I)

5.1.1 The prevalence and characteristics of self-inflicted burn patients

Of the 811 burn patients, 46 (5.7%) were classified as suicide attempters. There was no significant difference in the proportion of suicide attempters between females (6.6%, 14/211) and males (5.3%, 32/600).

The working status of patients differed markedly between suicide attempters and controls, particularly regarding unemployment and disability pension. There were significantly more unemployed male suicide attempters (36%) compared to the control male patients (13%, $\chi^2=8.36$, d.f.=1, P=0.004), but no significant difference in unemployment emerged among the females. On the other hand, a remarkably higher proportion of female suicide attempters had disability pension (50%) compared to only 8% among the female control patients ($\chi^2=19.16$, d.f.=1, P<0.001). This difference was found also among males, but it was less marked ($\chi^2=4.29$, d.f.=1, P=0.038).

5.1.2 The type of burn

Flame burn injury was the most frequent method of burning among all the patients (43%), but especially frequent among the women who had attempted suicide (93%). The median TBSA was 6.0% among control patients, compared with 24.0% among suicide attempters (P<0.001). In accordance with the higher overall severity among suicide attempters, the rate of death was also markedly higher among them (suicide attempters 17.4% (8 of 46) versus other patients 6.9% (53 of 765), $\chi^2=5.41$, d.f.=1, P=0.020).

5.1.3 Psychiatric morbidity and treatment of self-inflicted patients

The available information in medical records on psychiatric morbidity among the suicide attempters was limited and unevenly gathered. It was also unsystematically recorded, by burn care personnel, surgeon or in some cases by psychiatric consult, but nevertheless revealed high prevalence of severe psychopathology. Nearly all (40 of 46, 87%) of suicide attempters had some kind of history of psychiatric morbidity. During the final month preceding the suicide attempt, at least 16 subjects (35%) suffered from psychotic disorder, eight of whom had schizophrenia. In at least 10 cases (22%), there was clear evidence for depression, and in a further 18 (39%), some signs, symptoms or treatment for

depression. Half (23) of the suicide attempters had tried to kill themselves at least once earlier. Overall, 13 subjects were currently in psychiatric treatment and 20 had received previously some kind psychiatric treatment. Nine (20%) of the suicide attempts took place during psychiatric inpatient treatment. One third (15) of suicide attempters continued their treatment after the burn unit in a psychiatric hospital.

5.2 Mental disorders among acute burn patients (baseline) (study II)

5.2.1 Clinical variables

Of the 107 adult acute burn patients the majority were men, middle-aged, with low level of education and poorly employed. Psychiatric treatment history was common (See original article, Table 1). The burn injury happened mostly at home, combined often with smoking and alcohol use, but every fifth injury happened at work. The mean TBSA burned was 9% (See original article, Table 2). Over half of the patients (58.6%) stayed in hospital more than one week.

5.2.2 Mental disorders

During their lifetime preceding the burn injury almost two thirds (59.8%), and during the final month 40.2% of the subjects had at least one Axis I disorder (See original article, Table 3). During acute care in hospital, nearly half of the cohort was diagnosed with some Axis I disorder.

5.2.2.1 Axis I mental disorders (SCID-CV)

Substance-related disorders were by far the most common lifetime disorders (46.7%) among burn patients (See original article, Table 3). No significant gender difference was present in their prevalence (females 50.0% vs. males 44.7%). The prevalence of lifetime alcohol dependence was 35.5%. All patients with other substance-related disorders also had an alcohol-related disorder. Psychotic disorders were common, 10.3% of the subjects had a lifetime diagnosis. Every fourth patient had a mood disorder during their lifetime, 5.6% during the month prior to the burn, and four patients were depressed during acute care. Every fifth burn patient had a lifetime and 14% a current anxiety disorder, the most common being PTSD (7.5%) and simple phobia (7.5%). During acute care three patients (2.8%) had PTSD and six patients (5.6%) acute stress disorder. The latter was not included into total figure of any anxiety or any Axis I disorder.

5.2.2.2 Axis II personality disorders (SCID-II)

Almost one fourth (23.4%) of the acute burn patients had a personality disorder (See original article, Table 3). Cluster B disorders (18.7%) were most frequent; 11 patients had antisocial personality disorder and 16 borderline personality disorder (BPD). No significant gender differences were found.

5.2.2.3 Comorbidity of Axis I and Axis II mental disorders

Most (71.9%) of the burn patients with one lifetime Axis I disorder also had another lifetime Axis I disorder. Comorbidity between Axis I disorders was also present one month prior to burn in 39.5% and during acute care in 35.3% of subjects. The majority (60%) of patients with at least one personality disorder also fulfilled the criteria of another Axis II disorder; comorbidity between borderline and antisocial personality disorders was most common.

5.2.2.4 Current versus during acute care diagnoses

The overall prevalence of Axis I mental disorders increased significantly ($Q=6.40$, d.f=1, $p=0.011$) from the month prior to burn (40.2%) to acute care (47.7%) (See original article, Table 3). The prevalence of delirium in particular, was significantly higher (0.9 vs. 13.1 %; $Q=13.00$, d.f=1, $p<0.001$).

5.2.2.5 The influence of burn severity on mental disorders

Changes in prevalences of mood and anxiety disorders (one month prior to burn vs. acute care) were not significantly correlated with the severity of the burn injury (based on TBSA). However the level of anxiety symptoms (BAI, $r=0.22$, $p=0.029$) during acute care positively correlated with TBSA.

5.2.3 Symptom measures

Levels of self-reported depressive (BDI) and anxiety (BAI) symptoms were significantly higher in women than in men (See original article, Table 4). Women also had current suicidal ideation and alcohol misuse (AUDIT) more often than men. Five patients of all acute burn patients had a score ≥ 6 in the SSI, indicating moderate to severe suicidal ideation. One half of the cohort had hazardous drinking (AUDIT score ≥ 7 of 40).

5.3 Mental disorders during six-month follow-up (study III)

5.3.1 Clinical variables

Of the 92 adult acute burn patients in follow-up, the majority were men, middle-aged, and with a low level of education (See original article, Table 1). Many of the subjects had a history of psychiatric illness, psychiatric hospitalization, or suicide attempt before the injury. The mean TBSA was 9.7%, and 40% of severely burned patients (TBSA >20%) still had outpatient visits at the Burn Centre at six months (See original article, Table 2). They had hand burns significantly more often than the other burn patients (66.7% vs. 37.7%, p=0.038). Of the burn patients working or studying at baseline, more than three-fourths (76%), but none of those with severe burns, had returned to work at six months.

5.3.2 Mental disorders

5.3.2.1 Six-month post-burn prevalences of Axis I mental disorders

During the six months after burn injury more than half (55.4%), and during the final month of the follow-up one third (32.6%) of subjects had some Axis I disorder (See original article, Tables 3 and 5). In the acute care phase, nearly half of the cohort (44.6%) had some Axis I disorder (See original article, Table 5). Substance-related disorders were most common (27.2%), followed by anxiety and mood disorders (21.7% and 15.2%) and disorders due to GMC (16.3%). Only one fifth (21.4%) of the patients with depression, and one fourth (27.3%) of those with PTSD had no mental disorder before the burn injury. Two-thirds (7/11) of PTSD patients had PTSD for the first time in their lives. Of those with no pre-burn mental disorder, 36.8% (N=14) had at least one Axis I disorder during follow-up.

5.3.2.2 Point prevalences of mental disorders during follow-up

The point (i.e. one month) prevalence of overall Axis I disorders decreased significantly during follow-up, from 45% in the acute phase to 33% at six months. Significant decreases were found in the categories of substance-related disorders and those due to general medical condition (See original article, Table 5).

5.3.2.3 Comorbidity of Axis I and Axis II mental disorders

More than one third (37.3 %) of the burn patients with at least one Axis I disorder also had another Axis I disorder during the six-month follow-up. Likewise, comorbidity between Axis I disorders was present during acute care in 34.1% and during the final month before the second interview in 30.0% of subjects. Patients with personality disorder significantly more often had comorbid Axis I disorders during the six-month follow-up than those without personality disorder (84.2% vs. 47.9%, p=0.005), the comorbidity prevalence difference being even higher in acute care (84.2% vs. 34.2%, p<0.001) and during the last month of follow-up (68.4% vs. 23.3%, p< 0.001).

5.3.2.4 Influence of burn severity (TBSA) on mental disorders

In the patients investigated, the prevalence of mental disorders increased as burn injury exposure (TBSA) increased. This relationship between exposure and outcome was statistically significant with regard to Axis I disorders overall, and anxiety disorders and disorders due to General Medical Condition (GMC) specifically.

A multinomial logistic regression model predicting burn severity in different post-burn mental disorders, adjusted for gender and age, is presented (See original article, Table 4). Only disorders due to GMC were associated with moderately severe burns (TBSA=5-20). However, disorders due to both GMC and anxiety disorders were strongly associated with severe burns (TBSA>20%). Mood, psychotic and substance-related disorders were included in this regression model.

In a separate binary regression model, adjusted for gender and age, Axis I disorders (OR=27.9, p=0.02), PTSD (OR=5.5, p=0.049), and delirium (OR=21.3, p=0.002), but not major depressive disorder, were associated strongly with severe burns.

5.3.2.5 Correlation of post-traumatic symptoms with burn severity and with PTSD

Total score of IES-R did not correlate significantly with TBSA ($r=0.196$, $p=0.081$), albeit a weak correlation with the avoidance ($r=0.217$, $p=0.046$) and intrusive subscales ($r=0.229$, $p=0.036$). More than one fourth of patients ($N=26$, 28.3%) had no symptoms of post-traumatic stress. The mean total score of IES-R in the entire cohort was 9.05 (SD 12.43), and in PTSD patients 22.5 (SD 9.58). Only ten patients (12.5%) had a current IES-R total score above the cut-off for clinical concern for PTSD (24/88) at six months. The cut-off score used was that defined by Asukai (Asukai et al., 2002).

5.3.3 Change in other symptom measures during follow-up

Seventy-seven patients (83.7%) filled the same symptom measures two times, at baseline and at the end of follow-up. Since evaluation in acute care, the scores of self-report questionnaires declined somewhat overall. The decrease of anxiety symptoms (BAI) was statistically significant for the entire cohort (See original article, Table 6). The most significant decline was found among patients who had no mental disorder before the burn ($z=-3.227$, $p=0.001$), but also patients with a lifetime alcohol dependence or personality disorder ($p=0.006$ and $p=0.016$). Clinically significant suicidal ideation (SSI) was rare during the follow-up.

5.4 Psychiatric consultation and care (study IV)

5.4.1 Contact to psychiatric services after acute burn injury

Almost every third (28.3%) acute burn patient had contact to psychiatric services during the six-month follow-up after the burn injury (See original article, Table 1) . One fifth of the cohort had received psychiatric consultation and one fifth received actual psychiatric care. Psychiatric consultation and crisis intervention took place in hospital during acute care. All but one of the 18 patients in psychiatric consultation had at least one, and 61.1 % at least two, comorbid post-burn Axis I mental disorders. All six patients who went through crisis intervention had received their burn injuries in a devastating, frightening situation. They all had at least one and all but one at least two Axis I disorders during the six-month follow-up. Seven patients (39%) in psychiatric consultation and one of six patients in crisis intervention had a personality disorder. Psychiatric outpatient care followed variable time after discharge from hospital, but treatment in psychiatric hospital continued immediately after acute burn treatment in the two cases in which the burn injury had also happened in a psychiatric hospital. Two other burn patients were admitted to psychiatric department later during follow-up. Twelve patients (13%) still had ongoing psychiatric care at six months.

Treatment related to substance use and dependence during follow-up was not systematically investigated, but at least four (4%) patients were known to have received outpatient and three (3%) hospital treatment because of substance-related disorders.

5.4.2 Specific treatments received during follow-up

5.4.2.1 Psychotherapeutic treatment

During the six-month follow-up almost 20% of acute burn patients received psychotherapeutic support as treatment, but no one was in psychotherapy proper (See original article, Table 2).

5.4.2.2 Psychopharmacological treatment

Almost one half of all patients, and almost two thirds female, but one third male burn patients received some psychopharmacological treatment during follow-up (See original article, Table 3). More specifically, there were numerically large but statistically non-significant differences between female and male, respectively, patients in their specific psychopharmacological treatment; antidepressants (36% vs. 17%, p=0.051), benzodiazepines (43% vs. 27%, p=0.122) and hypnotics (39% vs. 22%, p=0.084). Three (6%) of the patients without any psychopharmacological treatment had some contact to psychiatric services. On the other hand, 15 (24%) of patients who did not receive psychiatric care on any level had been prescribed psychotropic drugs.

5.4.3 The need of psychiatric care versus the received psychiatric consultation and care

Psychiatric consultation during acute treatment was more common in the group with probable need (*group 2*) than among patients with unequivocal need (*group 1*) for psychiatric care (35% vs. 28%). However, almost half (48%; N=12/25) of acute burn patients with unequivocal need (27.2% of all) received psychiatric care during follow-up. Specifically, 86% of the patients with psychotic disorder, 50% of MDD and 40% of PTSD patients received psychiatric care during follow-up. Two of the four suicidal patients received treatment in a psychiatric unit during the six-month follow-up after discharge from burn unit. One had at first a regular contact to substance use outpatient services and the other continued his treatment, after somatic treatment, in hospital-like care for substance-related dependants.

Psychotherapeutic support was received by all seven psychotic patients, 42% of MDD and 50% of PTSD patients. Three in four patients (76%) in unequivocal need of psychiatric care received some psychopharmacological treatment and more than half (52%) of them antidepressants, 40% antipsychotics, 60% benzodiazepines. All psychotic patients received

psychopharmacological treatment, especially antipsychotics. Ten of the 12 MDD patients (83.3%) had some psychotropic and 58.3% antidepressant drugs. Six of 10 PTSD patients had some psychopharmacological and 60% antidepressant or hypnotic, 50% benzodiazepine treatment.

One fifth (21%, N=6/29) of the patients with probable need (32% of all) for psychiatric care (*group 2*) received it. They had significantly more seldom psychotherapeutic support than the patients with unequivocal need (10% vs. 52%, p<0.001). More than half (55%) of group 2 had some psychopharmacological treatment, one fifth (17%) antidepressants, one third antipsychotics (35%) and benzodiazepines (38%).

One of the 38 patients without any mental disorder (*group 3*) (41% of all) received psychiatric care, one psychiatric consultation, one psychotherapeutic support and six (16%) some psychopharmacological treatment. Three of 38 patients (8%) received antidepressants, benzodiazepines and hypnotics during follow-up.

5.4.4 The predictors of received psychiatric care after acute burn injury

The binary logistic regression model predicting post-burn psychiatric care by pre-burn psychiatric treatment, burn severity and need for post-burn psychiatric care, adjusted for gender and age, is presented in Table 4 of the original article. Pre-burn psychiatric treatment, severe (TBSA> 20%) burns and need for post-burn psychiatric care all independently and strongly predicted psychiatric care received after acute burn injury.

6 Discussion

6.1 Principal findings

In the nationally representative population, all burn patients (cohort I) admitted to the Helsinki Burn Centre during 1989-97, the proportion of self-inflicted patients was 6% which was somewhat higher than in most previous studies (study I). Self-inflicted patients had more severe burns (median TBSA 24%), and also markedly higher mortality, than the other burn patients (controls). Flame was almost always the method of self-inflicted burns.

Among all consecutive acute hospitalized adult burn patients (cohort II) admitted to the Helsinki Burn Centre, the majority (61%) suffered from mental disorders, including substance-related, psychotic, and personality disorders prior to burn (study II). The prevalences of Axis I disorders, particularly that of delirium, during acute care in hospital were higher than before the injury. Some mental disorders are likely enriched in acute burn patients, but the distress of the burn itself may also increase the prevalence of mental disorders.

In the prospective part of the study (study III) more than half of the patients (cohort II) suffered from at least one mental disorder during the six-month follow-up. The total picture of post-burn mental disorders seems to be much more variable, despite the results of previous studies, concentrating mainly on depression and PTSD. However, also in the present study, the prevalences of depressive disorders and PTSD were relatively high after the burn. The overall point prevalence of mental disorders and of most individual categories of mental disorders declined during six-month follow-up. As an epidemiologically important finding, the level of exposure, i.e. TBSA, had a strong relationship with presence of anxiety disorders and those due to GMC, but not to other disorders.

Although more than half (55%) of acute burn patients (cohort II) had at least one Axis I mental disorder during 6-month follow-up, only one fifth was assessed in psychiatric consultation after burn (study IV). Almost one half of the patients with an unequivocal need (27% of all) for psychiatric care and one fifth of all acute burn patients received psychiatric care. Except the most severe disorders, mental disorders seem, even if relatively common among burn patients, not to get enough attention.

6.2 Results

6.2.1 The differences of self-inflicted patients compared with other burn patients (study I)

In a cohort of all burn patients admitted during 8 years to the Helsinki Burn Centre almost 6% had burned themselves. More than 2/3 of them were men. Several earlier studies found almost equal gender disparity, but in favour of females (Andreasen and Noyes, 1975, Persley and Pegg, 1981, Layton and Copeland, 1983, Scully and Hutcherson, 1983, Davidson and Brown, 1985, Hammond et al., 1988, Meir et al., 1990, Swenson and Dimsdale, 1990, Sheth et al., 1994, Marchesan et al., 1997, O'Donoghue et al., 1998, Mabrouk et al., 1999, Mzezewa et al., 2000). Though, generally the samples have been small, range from 7 to 82 patients, in studies investigating self-inflicted burn patients. However, in recent studies especially from Asian, not so developed, countries show a strong majority of women among self-inflicted patients and self-burning among methods of suicide attempt (Laloe, 2002, Nakae et al., 2003, Maghsoudi et al., 2004, Mohammadi et al., 2008). This is in line with a recent worldwide review of deliberate self-burning studies (Laloe, 2004).

Compared with this perspective of gender disparity, the results of present study show a strong tendency of men in favour. In present study, suicide attempts differed from the other burn patients in frequency of unemployment among males, and of disability pension among females, even if rather little information could be gathered on the causes of disability, e.g. psychiatric illness or other. Suicide attempts were also younger than other burn patients, especially women. This tendency is in line with other studies from Western and Eastern countries (Laloe, 2004). In the present study, flame was the most common method of self-inflicted burns, the difference being statistically significant in men and especially in women. This is a common finding in most studies, especially concerning Latin (Hammond et al., 1988, Marchesan et al., 1997), Asian (Sheth et al., 1994) and Arab women (Mabrouk et al., 1999). Self-inflicted burn patients were injured more severely than the other burn patients (controls), and the difference was statistically significant both in men and women and in the whole group of self-immolation patients compared with other burn patients (controls). Similar results have also been reported in most other studies.

6.2.2 Mental disorders among acute burn patients (study II)

In the cohort of acute hospitalized burn patients almost two-thirds suffered from at least one lifetime Axis I mental disorder, and about one fourth at least one Axis II disorder. Psychiatric comorbidity, presence of concurrent Axis I and II mental disorders, was also common among burn patients. The overall prevalence of mental disorders was much higher than that found in the general population (Torgersen et al., 2001, Kessler et al., 2005b, Pirkola et al., 2005b, Perälä et al., 2007). The prevalences of lifetime substance-related (47%) and psychotic disorders (about 10%) as well as personality disorders (23%), especially borderline and antisocial, were markedly higher than those in major general population studies (Torgersen et al., 2001, Kessler et al., 2005b, Pirkola et al., 2005b, Perälä et al., 2007). Findings of alcohol dependence and abuse were congruent with self-reported patterns of alcohol use in the AUDIT. Strikingly enough, half of the female acute burn patients had at least one substance-related disorder, including alcohol abuse or dependence in all cases. This was more frequent than among men. As previous studies have reported and parallel to clinical experience, patients with acute burns are often under influence of alcohol and activities related to smoking are not uncommon. In the present study, more than half of the patients were under influence of alcohol at the time of burn injury and smoking or lightning of a cigarette were common at the moment of burn. Both of these states can be considered putative proximate risk factors for burn injury, and are particularly relevant issues of prevention among patients abusing substances. The significantly higher scores in self-report questionnaires (BDI, BAI and SSI) among female patients during acute care can suggest higher reactivity among women than men to the injury, although the positive correlation of TBSA with BAI was significant for the whole cohort.

Previously, only in one Swedish study, they used semi-structured interviews (SCID-CV) to diagnose the whole spectrum of lifetime Axis I mental disorders (Dyster-Aas et al., 2008), but not Axis II disorders. The most prominent study of those using structured interview, before the Swedish one, was conducted in the US by Fauerbach (Fauerbach et al., 1997). However, in this American study e.g. psychotic and eating disorders were not examined. The Swedish colleagues examined mental disorders lifetime, 12 month prior to burn and during acute care in hospital. In the present study, mental disorders during final month before burn were also examined. The average severity of burn injuries was higher among Swedish than Finnish burn patients. In both studies, the prevalences of substance-related disorders were similar while all subjects with other substance abuse or dependence also had alcohol abuse or dependence. In the present study, lifetime substance-related and psychotic disorders antecedent to burn injury were even more common than in the Swedish one (46.7% vs. 32%, 10% vs. 4%) respectively (Dyster-Aas et al., 2008). Comprehensive previous studies (with method of structured interview) also investigating psychotic

disorders were not found for comparison. Mood disorders were more common in Swedish than in Finnish burn patients (42% vs. 25%). Overall, high lifetime prevalence of mental disorders among acute burn patients was found in both of these studies. However, neither of these studies had a general population control group, and therefore, comparisons with the general population can only be regarded as tentative. Nevertheless, patients with moderate to severe burns at least appear to have clinically significant mental disorders in excess of expectations based on general population prevalences (Torgersen et al., 2001, Kessler et al., 2005b, Pirkola et al., 2005b, Perälä et al., 2007).

The potential role of pre-burn mental disorders in predisposing to injuries, or in complicating acute treatment and rehabilitation has been investigated during decades (Malt and Ugland, 1989, Patterson et al., 1993, Wisely et al., 2010). The role of personality traits, in particular impulsivity, to proneness to accidents and burn injuries has been studied recently in Italy (Pavan et al., 2009). The results were in line with the present study as well as with clinical experience, suggesting personality traits and mental disorders likely to predispose to burn injuries. In the present study, it was particularly noteworthy that psychiatric comorbidity between substance-related, psychotic and personality disorders was present, with high prevalences of each of them among burn patients. Like in some previous studies, the prevalence of delirium in acute care was high in this study, and increase in prevalence after the burn injury was significant (Blank and Perry, 1984, Patterson et al., 1993).

6.2.3 Mental disorders in follow-up after burn injury (study III)

More than half of acute burn patients had at least one mental disorder during the follow-up. Substance-related disorders (27%) and anxiety disorders (21%) were the most common. Twelve percent of patients had PTSD, and 15% depressive disorder. Analogous with the previous literature, the prevalence of PTSD increased from pre-burn lifetime prevalence, but the prevalence of depression was clearly lower than lifetime before the injury (Van Loey and Van Son, 2003). One fourth of patients with PTSD did not have any mental disorder before the burn injury. When including only patients with burns with TBSA>5%, as in the studies most similar to the present one (Fauerbach et al., 1997, Dyster-Aas et al., 2008), the prevalence of major depression patients with no pre-burn mental disorder was close to the prevalence which the Swedish colleagues found in their study (16.7%-18.2%) (Dyster-Aas et al., 2008).

Importantly enough, there was a clear relationship between burn severity and mental disorders overall, with variation depending on the type of disorder in the present study. The correlation of burn severity and mental disorders was strongest for Axis I disorders overall, and anxiety disorders as well as disorders due to GMC specifically. One third of patients with minor burns (TBSA< 5%), two-thirds with moderate burns (TBSA=5-20%), and all but one of the severely burned patients (TBSA >20%) suffered from at least one mental

disorder during follow-up. Burn severity also correlated positively with anxiety measures, with symptoms of anxiety in general (BAI) in acute care, and with post-traumatic symptoms (IES-R) at the end of the six-month follow-up.

The overall picture of the probable relationship between burn severity and mental disorders in earlier literature seems ambiguous and conflicting although some previous studies reported a weak or no connection between burn severity and post-burn mental disorders (Van Loey and Van Son, 2003). This can be related to methodological problems in these studies. In particular, in studies excluding minor injuries (Fauerbach et al., 1997, Dyster-Aas et al., 2008), the variation in level of exposure is limited and this makes it more difficult to verify a relationship between exposure and outcome, and the potential role of burn severity in predisposing to mental disorders during follow-up therefore remains uncertain.

Mental disorders may predispose to burn injuries, and burn injuries may also predispose to mental disorders. Related to this, in study II, a high proportion of acute burn patients had mental disorders, especially lifetime substance-related, psychotic and personality disorders before burn injury which could be considered a predisposition to burn injury. In the present study, severity of burn injury was related to mental disorders, which is consistent with the finding that the overall prevalence of mental disorders decreased, and the symptoms of mental disorders were alleviated during the six-month follow-up. From Van Loey's review of 2003 some earlier studies had the same kind of results (Van Loey and Van Son, 2003). In the study of Fauerbach, the prevalence of substance-related disorders among burn patients in follow-up declined (Fauerbach et al., 1997), as in present study. The prevalence of delirium declined significantly after acute care in the present study as previous American studies have also reported. In these studies, the prevalence of delirium among severely burned patients was even higher than in the present study (Patterson et al., 1993). Although, the overall recovery from mental disorders at six months after burn injury was good, one third of the cohort still had at least one diagnosable mental disorder, e.g. anxiety or substance-related disorder, symptoms of mental disorders being, however, mild. As three-fourths of those working before burn injury had returned to work at six months, concurrent improvement in functioning must be considered also very good. In a very recent, Australian systematic review summarizing all substantial (N=21) studies investigating the returning to work among burn patients, the most significant barrier to returning to work was the severity of burn (Quinn et al., 2010).

The two preceding studies most similar to present study, using structured clinical interview in examining both pre-burn and post-burn time periods, focused mainly on course of selected mental disorders, such as depression and PTSD, in follow-up (Fauerbach et al., 1997, Dyster-Aas et al., 2008). The present study was conducted because a need seemed to exist for more comprehensive investigation of the outcome of overall mental disorders and psychological symptoms in different time frames of follow-up. Importantly enough, this

study differs from the above American and Swedish studies (Fauerbach et al., 1997, Dyster-Aas et al., 2008) by also including all acute consecutive burn patients, instead of selecting only those with TBSA > 5%. The sample size in the present study was larger than in earlier studies using structured clinical interview for assessing mental disorders.

6.2.4 Psychiatric consultation and care during follow-up after burn injury (study IV)

In this prospective study, only one fifth of the cohort was assessed in psychiatric consultation during six-month follow-up although 55% of the cohort had at least one Axis I mental disorder. Only one half of the patients with an unequivocal need (27% of all) for psychiatric care and one fifth of all acute burn patients received psychiatric care. Overall, mental disorders, except the most severe, among burn patients seem, not to get enough attention. The results were in line with earlier studies in Europe and North America (Holaday and Yarbrough, 1996, Fauerbach et al., 1999, Van Loey et al., 2001, Dyster-Aas et al., 2008).

Although patients with psychotic disorders seemed to receive the best psychiatric care among acute burn patients, at least in the form of psychotropic pharmacotherapy and psychotherapeutic support, they are not always assessed in psychiatric consultation, as also was the case with those patients treated because of suicide attempt. On the other hand, of all the patients having unequivocal need for psychiatric care (i.e. psychotic disorders, MDD, PTSD and suicidal patients), only half receive it. Despite the fact that weekly meetings of the multidisciplinary burn team (including a psychiatrist) in the Unit exists, it seems that too many acute burn patients with severe mental disorders needing psychiatric evaluation do not meet a specialist. Furthermore, because of the timing of psychiatric consultation some of the mental disorders needing treatment seem to be missed during further follow-up.

The adequacy of the specific psychiatric treatments provided in this study, psychotherapeutic or psychopharmacological, was not possible to evaluate due to lack of sufficiently detailed information on treatments and patients' responses to them. Though, the fact that none of the patients admitted to tertiary level unit of acute burn care received proper psychotherapy, neither after the injury in acute care nor later during follow-up, seems not satisfying even if every sixth burn patient had psychotherapeutic support in form of some kind of psychosocial treatment.

In the present study, regarding psychopharmacological treatment, the medical records covered best the acute treatment in hospital, when antipsychotics, hypnotics and benzodiazepines mostly were prescribed. Information on later phases of treatment was obtained from the patients themselves in the second interview. Almost one half of the cohort had some psychopharmacological treatment during follow-up, women more often than

men. This is in line with the Swedish study mentioned earlier (Dyster-Aas et al., 2008). Antidepressant drugs were prescribed more often in anxiety (e.g. PTSD) than in mood disorders but modern antidepressants have mostly both indications. Antipsychotics and the rest of other psychopharmacotherapy were not prescribed with so specific an indication as antidepressants although e.g. all patients with psychotic disorder used antipsychotics. The rest of effective and heavy use of antipsychotic and other non-antidepressant-psychotropic drugs was mostly present in acute care especially during intensive care phase and because of the high prevalence of delirium.

6.3 Methods

In this thesis, the strengths include several issues, including the fact that both cohorts of burn patients are based on an epidemiologically representative sample of burn patients. The Helsinki Burn Centre treated virtually all severe burns in Finland until 1994, when the Burn Unit in Kuopio University Central Hospital was founded, since then the proportion has been approximately two-thirds (Papp et al., 2001). Burns with milder severity have been treated in Department of Plastic surgery in Oulu University Central Hospital and other hospitals covering the rest of the current total amount of 900 annual hospitalized burn patients in Finland (National Institute for Health and Welfare, 2010).

6.3.1 Cohort I

This retrospective study focusing on self-inflicted burns was based on a systematic and comprehensive register including all burn patients treated during the research period. This is an important strength of this study, as is the identification of self-inflicted patients by a psychiatrist. The relatively large number of cases (46), and particularly control patients (765), was an asset for statistical analysis. On the other hand, the main limitation of this study, as in all earlier reports, was limited information on the psychiatric morbidity underlying the suicide attempt. Even based on fragmentary information, it appeared that the vast majority of those attempting suicide by burning themselves suffer from severe mental disorders. Among limitations should be mentioned that in the Burn register data used in the study, systematic information on psychiatric morbidity was not included, and was only sometimes detailed in the records. In addition, because the medical records were written by a surgeon, psychiatrically relevant facts such as suicide attempts are probably not always recorded. Furthermore, this possibly can result in an underestimate of the proportion of suicide attempters. Among original aims of the study the mortality of burn patients was not included and because of this, its proportion in reporting results and as a topic of discussion remained in minor role. The comparison of mortality figures of self-inflicted and other burn patients (controls) was based on the computerised Burn register to have concordant method of information. However,

because more information was gathered of self-inflicted patients in detail it was also more exact in considering mortality. This mortality figure was even higher than the reported one which underlines the higher lethality of the burn injuries of self-inflicted patients compared to other burn patients.

6.3.2 Cohort II

6.3.2.1 Mental disorders at baseline

An important strength of this study is in the use of semi-structured diagnostic interviews (SCID-I and II) by an experienced psychiatrist. The whole spectrum of DSM-IV mental disorders was carefully examined, including Axis II disorders, and in three time frames (lifetime before burn, final month before burn, during acute care in hospital), albeit retrospectively. No previous studies thoroughly investigating pre-burn mental disorders during these time frames were found. Furthermore, no earlier comprehensive study (with structured interview) investigating the Axis II personality disorders among burn patients were found.

In the present study, at first, in focus were the disorders present during lifetime overall, or immediately before the burn, to distinguish them from post-burn disorders, especially those present shortly after the injury. This helped to analyze the complex relationship between mental disorders and on the burn injury itself. The post-burn mental disorders present in the acute care phase were also thoroughly investigated. Previous studies comparing prevalences of mental disorders during the final month prior to burn and immediately after injury were not found. Though, among the few previous studies (Fauerbach et al., 1997, Dyster-Aas et al., 2008) using structured interview to assess mental disorders prior to burn, a Swedish study also used the time frame of 12 months prior to burn (Dyster-Aas et al., 2008). In following up after burn injury, one study reported prevalences first time by discharge from hospital (Fauerbach et al., 1997) and the other one in acute care (Dyster-Aas et al., 2008). Neither of these studies reported the exact time between the burn injury and the interview. These methodological differences make it difficult to directly compare the previous findings with findings of the present study. The delay between burn injury and baseline interview in this study was short, and mainly due to the poor physical condition of the patient. While interview in the acute treatment phase minimizes retrospective recall bias, it also influences the prevalences of some mental disorders, especially disorders necessitating time to fulfil the diagnostic criteria.

A further strength of the present study is the size of the cohort (N=107), which was larger than in any earlier study using structured interviews. Refusals were rare. It is also important to note, that this study differs from the comparable previous studies (Fauerbach et al., 1997, Dyster-Aas et al., 2008) in deliberately including all acute consecutive burn patients, instead of selecting only those who had burns with TBSA > 5 per cent. This can also be considered as a methodological strength.

Further limitations include that a proportion of burn patients could not be included in the sample either due to death (12%), disability in cognitive or sensory functioning (12 %), or rapid transfer to another hospital after immediate burn care (6%). Even if recognized worldwide as "golden standard" of assessing diagnosis for mental disorders, SCID has its limitations. Retrospective evaluation of lifetime and current (=final month) diagnosis can never be totally exact which is important to notice in all these kind of studies. The tendency is usually to underestimate rather than to overestimate the prevalences of Axis I mental disorders. However, in the present study, the delay between burn injury and baseline interview was short. While interview in the acute treatment phase minimizes retrospective recall bias, it can also influence the prevalences of some mental disorders. Furthermore, the coverage of SCID-CV is somewhat weak with regard to anxiety disorders. Anxiety symptoms were also investigated using the Beck Anxiety Inventory (BAI), with convergent findings. SCID-II also has its own limitations e.g. while during depressive episode or crisis overestimation of the prevalence of personal disorders can follow. The diagnosis of personality disorder persisted only in about half (43%) of the 81 MDD patients diagnosed with personality disorder at baseline in the Vantaa Depression Study in Finland (Melartin et al., 2010).

Noteworthily enough, inclusion of all consecutive acute burn patients, also those with low burn severity (i.e. TBSA< 5 %) into the cohort, may influence prevalence of specific mental disorders, presuming that size of burn may correlate with mental disorders. Because this part of the study focused on only in early acute phase of hospital treatment, all post-burn mental disorders were likely not yet present at the time of baseline interview. The generalizability of findings of the present study to other settings remains difficult to estimate in the absence of comparable studies.

6.3.2.2 Mental disorders in follow-up

This prospective and longitudinal follow-up part of the study was based on the earlier described cohort of all consecutive acute hospitalized burn patients admitted to the Helsinki Burn Centre. An experienced psychiatrist repeated structured diagnostic interview at six months, to assess diagnosis for mental disorders. During the follow-up drop outs were scarce (14%). Since these patients, non-participants of the follow-up study, overall

had more severe psychopathology at baseline, findings are likely to slightly underestimate the prevalence of mental disorders among burn patients during follow-up. The sample size in the present study was larger than in earlier studies that have used structured clinical interview for assessing mental disorders and the drop outs were less.

However, limitations of this study include e.g. that the number of cases in specific diagnostic subgroups were often small, suggesting caution in interpreting findings. Further, six months probably is an early phase to assess recovery from the burn itself and from post-burn mental disorders when recovery from and rehabilitation of most severe burn injuries can take years or, even decades (Low, 2007). Longer follow-up could have also revealed possibly differing subsequent differential trajectories of recovery from mental disorders.

Finally, although widely used as an overall measure of burn severity, TBSA is a gross measure of injury severity. Depth of injury, or some subgroups, such as inhalation burns, might also be relevant factors to consider. On the other hand, TBSA was exclusively documented for every burn patient in the cohort.

6.3.2.3 Psychiatric consultation and care

Helsinki University Central Hospital is the major educative hospital in Finland having a tradition of consultation/liaison psychiatry for 40 years and for half of this period a Burn Centre with multidisciplinary burn team, including consultative psychiatrist and psychiatric nurse from the beginning.

Even if all medical records of the total follow-up time could not be reached, the ability of the patients to cooperate and participate in six-month structural diagnostic interview (92 of 107, 86%) show that the essential information of all contacts to psychiatric services was caught and also the relevant information of psychiatric treatment in more detail. Among the aforementioned methodological strengths of the present part of the prospective study there should be added the naturalistic and observational design, the researcher did not at all participate to decision process in relation to contact to psychiatric services. Because the patients in the study were within the burn treatment system this was not considered as an ethical problem.

However, the study also has limitations. Although the patients that dropped out (N=15) during follow-up did not differ significantly from interviewed subjects (N=92) in demographics or burn severity, they more often had a history of suicidal acts before burn, Axis I mental disorders during the final month preceding burn and lifetime borderline personality disorder than participants remaining in the study. According to clinical experience, these patients have a remarkable need for health services. Thus, the results can underestimate the need and use of psychiatric services by all acute burn patients.

Further, information in medical records was insufficiently exact regarding psychotherapeutic treatment and the dosage, duration, timing or adherence with the psychopharmacological treatment to be reported. Thus, to evaluate the adequacy or efficacy of these specific treatments on an individual level was not possible. Furthermore, whether the decrease of the overall or specific prevalences of mental disorders during follow-up was due to these treatment interventions was not possible to evaluate.

In addition, the generalizability of the findings concerning psychiatric care after burn injury is also limited nationally e.g. because the capacity for liaison/consultation psychiatry vary a lot between hospitals and is probably more limited compared with that of Helsinki University Central Hospital (Suominen et al., 2004) and also internationally e.g due to differences between countries in health care settings responsible for treatment and rehabilitation of various types of burns. However, the identification of mental disorders early enough in general, in acute phase or during further burn treatment, seems more crucial and more important than the place where the psychiatric treatment is received.

7 Conclusions

In this thesis, the pre-burn and post-burn prevalences of several mental disorders were much higher than among the general population, and the proportion of self-inflicted burns of all burn patients higher (6%) than in most Burn Units of the developed Western world. Self-inflicted patients had markedly more severe burns and higher rate of death which highlights their importance as a subgroup among all burn patients. Substance use disorders, psychotic disorders and personality disorders were most likely to be enriched among acute burn patients. Although a strong relationship was found between burn severity and some post-burn mental disorders, the prevalence of mental disorders declined over time after the immediate acute treatment phase. A small minority of acute burn patients get psychiatric consultation and care after burn injury. Less than half of those with estimated unequivocal need for psychiatric treatment receive it, however mostly only in the form of pharmacotherapy.

8 Implications

Only a couple of studies using a comprehensive method (e.g. DSM/SCID) in assessing mental disorders among burn patients in different time frames, before and after injury, and during burn treatment process, exist. The samples in these studies are though rather small. Thus, multi-unit cooperative, national or international, prospective surveys seem to be essential to get reliable results and to make the right conclusions. Specific mental disorders could then be better treated according to current care guidelines which include a preventive recommendation of specific disorders.

Long-term effects of burn injuries warrant further prospective studies. While severe burns require a long treatment and rehabilitation period, years possibly even decades, longer prospective follow-up studies with method of structural interview are needed to find out the long-term development of prevalences of overall and specific mental disorders. The importance of burn injury specifically, e.g. depth and location of the burn, in relation to the incidence of comprehensively assessed mental disorders during follow-up, could deserve more focus in future studies, as it may have remarkable long-term impact on rehabilitation.

Clinical implications of high importance for the future include prevention of self-inflicted burns. The optimal treatment of patients with psychiatric disorders and suicidality seems the most important. Second, reducing access to inflammable liquids and avoiding inflammable clothes in psychiatric institutional settings, among others, appear relevant.

Delirium, psychotic disorders, substance-related disorders and severe personality disorders are major concerns for the staff of burn units during acute care and rehabilitation. Withdrawal symptoms of patients dependent on or abusing alcohol and drugs complicate acute treatment of burns. These patients have a particularly high risk of delirium, and consequently, may have increased morbidity and mortality. Patients with psychotic and substance-related disorders are often very challenging because of poor coping, and less than optimal adherence. Recognition of these complicating factors and accounting for them by means of more frequent well timed psychiatric consultation possibly followed by other psychiatric interventions, could improve their treatment outcomes.

The over-representation of substance use disorders among women, very hazardous long-term alcohol drinking in specific, should implicate preventive interventions in the future to avoid burn injuries and other traumas common for this group of patients. Probably a more active "heavy hand" referral from the Burn Unit to substance use clinics could have impact in better management of burn treatment and in prevention of further traumas.

Pain, pruritus and anxiety have also been reported comorbid and separate as background for other somatic and psychiatric problems during acute care. Effective treatment of these (pharmacological and other) symptoms and disorders could help with management of burn treatment itself.

Burn injuries may also predispose to mental disorders and in the present study, severity of burn injury was related to mental disorders, which is consistent with the finding that the overall prevalence of mental disorders decreased, and the symptoms of mental disorders were alleviated during the six-month follow-up. The optimal burn treatment in itself is focused on this point as preventative for mental disorders.

An important clinical implication which came up from this thesis, is the issue of timing of psychiatric consultations and other psychiatric attention. At present, consultations happen almost exclusively during hospital acute care, dealing with mainly acute stress and delirious states. However, many mental disorders, e.g. depression and PTSD, develop slower and during the rehabilitation phase of burn treatment. Psychiatric evaluation and consultation seem to be missing after acute hospital care. There seems a need for a psychiatric consultation also after acute hospital treatment in the Burn Centre. Visits to plastic surgeons, scar-repairing operations in hospital, or other visits included in the rehabilitation follow often routinely. For the most severely scarred burn patients, because of their disability to seek psychiatric care elsewhere, this may be the only possibility. The role of the burn team, including the consultative psychiatrist and nurse, in evaluating need for psychiatric services could probably be widened to include the rehabilitation phase.

Brief screening for depression; e.g. 2-question case-finding instrument (Whooley et al., 1997), PTSD symptoms; IES-R (Weiss and Marmar, 1997) and coping after burn; Brief COPE (Carver, 1997) during outpatient visits to surgeons or to other staff following acute hospitalization could be considered, in particular among patients with severe burns or pre-burn psychiatric history. Currently it seems that even the mental disorders with unequivocal need for psychiatric care can remain unrecognized during outpatient visits to Burn Unit, which can complicate the burn treatment itself and rehabilitation.

Overall, psychiatric consultations and care appear to follow temporarily the course of acute hospital-based burn treatment, rather than the course of the mental disorders and need for treatment. More frequent and well timed psychiatric consultation intensively combined with the whole burn treatment process itself, also after acute care in hospital, could lead to better management of post-burn psychiatric care as well as better management of the burn treatment and rehabilitation itself.

9 Acknowledgements

This study was carried out at the Mood, Depression, and Suicidal Behaviour Unit, Department of Mental Health and Substance Abuse Services of the National Institute for Health and Welfare, Helsinki (former Department of Mental Health and Alcohol Research of the National Public Health Institute, Helsinki), and at the Departments of Psychiatry and Plastic Surgery of Helsinki University Central Hospital (HUCH). I wish to thank both the former and the present President of the National Public Health Institute and National Institute for Health and Welfare, Professor Jussi Huttunen, and Professor Pekka Puska for the facilities provided to me by the Institute. I want also to express my gratitude to the former head of the Department of Plastic Surgery in HUCH, Professor Sirpa Asko-Seljavaara and to the present head Professor Erkki Tukiainen for providing their support and facilities for the research work in the Töölö Hospital - in the Archives and in interviewing the patients in the Burn Centre. As an academic dissertation, this work took place in the Department of Psychiatry at the University of Helsinki, for which I am most grateful.

I wish to express my sincere gratitude to Professor Jouko Lönnqvist, head of the Department of Mental Health and Substance Abuse Services of the National Institute for Health and Welfare, Helsinki, for initially showing me the different possibilities of research in suicidology and consultation/liaison psychiatry throughout his career and suggesting personally to me to focus my study especially on burn patients. This helped me in one of my long-standing dreams coming true. I thank him for the opportunity to commence my research work at the National Institute for Health and Welfare, and experiencing its scientific atmosphere. I also wish to express my special gratitude to Docent Timo Partonen, the present head of the Mood, Depression, and Suicidal Behaviour Unit, for encouraging me to start and continue my research work from the very beginning (since our cooperation in late 1990s in the Psychiatric Outpatient Clinics of HUCH). I am grateful for the opportunity to continue my research work in the present unit premises, and for giving me valuable practical advice in later phases of my research activity.

I want to express my deep gratefulness especially to my supervisors Professor Erkki Isometsä and Docent Kirsi Suominen for giving me an endless research project, besides their contagious enthusiasm, advice, support and encouragement.

The profound knowledge of Erkki of different areas of research e.g. mood disorders, suicidology and different aspects of life, has been very admirable for me. I have enjoyed the numerous meetings with him and Kirsi - together and separately. Erkki has never got tired of reminding me of "activating brain cells before getting in practical actions" in different phases of the research. This felt to me as always wise, generous and stimulating advice. Although often extremely busy, he has always found time for my questions. His contribution to the accomplishment of this dissertation has been essential.

I am deeply grateful to Kirsi, who has helped me a lot in the different phases of my research in the beginning and while writing the manuscript. I have valued highly her timely and thorough reviews of my manuscripts. I have enjoyed the many meetings with her, and have found her wide range of points of view as a very experienced researcher and supervisor as well as the Chief of the Department of Psychiatry in Jorvi Hospital (HUCH), very important for me. She never did get tired of underlining the positive sides of doing research alone (with supervisors), instead of being one of several researchers in a large group. She also always tried to keep up the positive enthusiasm for scientific work. This was especially needed during the very early phases of material catchment.

I would like to thank the reviewers of this thesis, Professor Heimo Viinamäki and Professor Pirkko Räsänen, for their valuable advice and constructive criticism, which significantly improved the text.

I want to warmly thank my fellow-researchers and co-authors, Docent Jyrki Vuola, Docent Antero Leppävuori, and Professor Jouko Lönnqvist for their collaboration and scientific contribution to the manuscripts.

Without the collaboration and support of Docent Jyrki Vuola as plastic surgeon and leader of the Burn Centre, and his supervision for my presentations in international Congresses of European Burn Association (EBA), I could not bring this project to this point. I also want to warmly thank former chief nurse Kirsi Mikkonen for her positive attitude towards me in introducing my research approach in Helsinki Burn Centre. However, I should underline that without the collaboration and positive attitude and support of the entire personnel, especially the present chief nurse of the Burn Department Markku Laitila, my research activity and the whole project in the Helsinki Burn Centre would not have been possible. During the project, several surgeons have been working in the Burn Centre but the most important contribution, except Dr. Vuola, was naturally done by Docent Virve Koljonen, the other Plastic Surgeon specialized for burns in the unit. I want to express my special thanks to her.

I want to thank also my fellow-researchers Mikael Holma, M.D., Ph.D., and Irina Holma, M.D., Maria Vuorilehto, M.D., Ph.D., Petri Arvilommi, M.D., and many others for the time shared at the Institute.

My warmest special thanks to Marjut Grainger for creating the material from numerous details to a real data to be analyzed. She has always been active in her attitude towards my problems with statistical things. Cooperating with her has really been a pleasure for me. She has also made the layout of this book.

My warmest thanks to Olli Kiviruusu for his patient, long-term and very practical help with computer programs, statistical problems, and in preparing the data for the analyses. I would also like to thank Professor Mikko Ketokivi for an important consultation session on statistical problems, especially logistic regression.

I want to express my gratitude to Sirkka Laakso, Tiina Hara, Tuula Koski and Eeva-Liisa Orelma, the secretaries of the Institute during these times, for their help in various practical matters. My warmest thanks also to Anna Laakko, the secretary of my chief supervisor, in Department of Psychiatry, University of Helsinki.

I would like to thank the professionals at the Helsinki University Language centre and Kirsi Niinistö in the Institute for revising the text of the original manuscripts. Special thanks to Matthew Grainger for reviewing the text of this thesis.

I want also to thank the library personnel at the National Institute for Health and Welfare, and at the University of Helsinki for their help, especially my warm thanks belong to Jukka Lindeman for helping and advising me with the Endnote software.

I have had the pleasure to work with numerous colleagues over the years and I want to thank them all, as well as all the personnel of the different clinics where I have been working. In Eastern Department of Psychiatry in Helsinki City I received important support from my chief Docent Martti Heikkinen in the difficult creation phase of my first article. Since the beginning of my clinical work in HUCH, I wish to express my warmest gratitude to my former chief, Professor Matti Virkkunen, in the Department of Forensic Psychiatry, for his supporting and enthusiastic attitude towards research activity among colleagues in his Department. For me, the hardest time was when the interviews were going on in the Burn Centre, besides the clinical work. At that time I felt the support of Professor Virkkunen especially important. All my co-workers at the same time, the personnel of the former department of forensic examination in HUCH, deserve warm thanks because of their patience and support.

I am most grateful to my family, and friends for their support in numerous ways during these years. I want to express my gratitude to my parents Oili and Erkki, and my brother Kari, as well as to my own family. They all have supported me in my efforts despite the struggle with my father's and wife's severe problems of health during the same time. My warm thanks especially to my mother for having enough energy for all this, despite severe problems with her own health. During my research work my two daughters, Maria and Anna, have grown towards adulthood and independence. I hope them success in the careers they choose themselves. I want to express my deepest love to my wife Raissa and my daughters and thank them for their patience with my long-term project towards this dissertation. Without all of you this project would not have been possible.

This study has been financially supported by research Funds of Helsinki University Central Hospital (HUCH), and the National Institute for Health and Welfare, Helsinki.

Finally, I express my warmest appreciation to all the patients participating in this study.

Helsinki, December 2010

Raimo Palmu

10 Appendices

Appendix 1

PALOMIELI-tutkimuksen esitietolomake

Päivämäärä _____

Potilaan nimi _____

Tutkija _____

Potilaan henkilötunnus _____

Potilasnumero _____

Potilaan tutkimuskoodi _____

(S=IMY-CASE; C=CONTROL)

TAUSTATIETOJA JA TYÖTILANNE

1. SIVILIISÄTY

1. NAIMATON
2. AVOLIITOSSA
3. AVOLIITOSSA TAI REKISTERÖITY PARISUHDE
4. ERONNUT TAI ASUMUSEROSSA
5. LESKI

2. ASUMISMUOTO

1. YKSIN
2. VANHEMPIEN KANSSA
3. OMASSA PERHEESSÄ
4. TOVERIASUNTO/PIENKOTI/KUNTOUTUSKOTI
5. MUU

3. KOULUSIVISTYS

1. OSA KANSA- TAI PERUSKOULUA
2. KANSA-, PERUS- TAI KESKIKOULU
3. OSA LUKIOTA
4. YLIOPPILASTUTKINTO

4. AMMATTIIN JOHTAVA TAI VASTAAVA KOULUTUS(YLIN KOULUTUS)

1. YLIOPISTO TAI KORKEAKOULUTUTKINTO
2. OPISTOASTEEN TAI AMMATTIKORKEAKOULUN TUTKINTO
3. AMMATTIKOULUN TUTKINTO
4. OPPISOPIMUSKOULUTUKSEN
5. MUU TUTKINTO
6. EI MITÄÄN EDELLISISTÄ

5. TYÖPAIKKA/TYÖSUHDE TÄLLÄ HETKELLÄ

1. EI _____
2. ON, MIKÄ _____

6.TYÖSTATUS

1. TYÖTÖN TAI LOMAUTETTU, TÄHÄN MENNESSÄ ____ KK
2. SAIRASLOMA, TÄHÄN MENNESSÄ ____ KK
3. ELÄKKEELLÄ, PSYYKKISISTÄ SYISTÄ
4. ELÄKKEELLÄ FYYSISEN SAIRAUDEN, VIAN TAI VAMMAN VUOKSI
5. OPISKELIJA
6. EI PALKKATYÖSSÄ MUISTA SYISTÄ(ESIM.KOTIÄITI)
7. TYÖSSÄ TÄLLÄ HETKELLÄ

7. HUOLLETTAVAT (= ALLE 18-VUOTIAAT) LAPSET

1. EI OLE _____
2. KYLLÄ, _____ LASTA

TALOUEDELLINEN TILANNE

8. TOIMEENTULO OMASTA MIELESTÄ

1. HYVÄ
2. KOHTUULLINEN
3. MELKO HUONO
4. HUONO

9. TOIMEENTULOTUEN TARVE VIIMEISEN 12 KUUKAUDEN AIKANA

1. EI LAISINKAAN
2. KERRAN
3. USEITA KERTOJA
4. YLI PUOLET TOIMEENTULOSTA

TERVEYDENTILA ENNEN PALOVAMMAA

10. AIKASEMMAT PITKÄAIKAISET ELIMELLISET SAIRAUDET (JOTKA VAATIVAT JATKUVAA HOITOA JA/TAI VAIKUTTAVAT JOKAPÄIVÄISEEN ELÄMÄÄN) JA KO. SAIRAUDEN ALKAMISIKÄ

1. SYDÄN- JA VERENKIERTOELIMISTÖN SAIRAS, MIKÄ _____; ALKOI _____
2. NEUROLOGINEN SAIRAS, MIKÄ _____; ALKOI _____
3. AINEENVAIHDOULLAISNEN SAIRAS(ESIM.SOKERITAUTI), MIKÄ _____; ALKOI _____
4. KEUHKOSAIRAS, MIKÄ _____; ALKOI _____
5. MUU, MIKÄ _____; ALKOI _____
6. EI AIEMPIA SAIRAUKSIA

11. ELIMELLISTEN SAIRAUKSIENTA AIEMMIN SAADUT HOIDOT(SAIRAALAHOITOA EDELLYTTÄNYT)

1. LEIKKAUSHOITO, MIKÄ _____ MILLOIN _____
2. MUU, MIKÄ _____ MILLOIN _____
3. EI HOITOJA

12. AIEMMAN PSYKIATRISEN SAIRAUDEN HOITO ON OLLUT/ EI OLE OLLUT
1. ENSIMMÄINEN KONTAKTI PSYKIATRISEEN ERIKOISSAIRAANHOITOON
MILLOIN _____, MISSÄ _____
 2. ENSIMMÄINEN KONTAKTI PSYKIATRISEEN AVOHETOON
MILLOIN _____, MISSÄ _____
 3. ENSIMMÄINEN PSYKIATRINEN SAIRAALAHOITO
MILLOIN _____, MISSÄ _____
 4. VIIMEISIN SAIRAALAHOITO ALKOI
MILLOIN _____, MISSÄ _____
 5. PSYKIATRISTEN SAIRAALAHOITOJEN LUKUMÄÄRÄ _____ KPL
 6. PISIN SAIRAALAHOIDON KESTO _____ VRK
 7. VIIMEISEN SAIRAALAHOIDON DIAGNOOSIT _____
 8. LÄÄKEHOITO
MIKÄ _____
ANNOS _____
- 13A. AIEMPI ITSETUHOISUUS
1. EI ITSEMURHA-AJATUKSIA
 2. ITSEMURHA-AJATUKSIA
 3. ITSEMURHAYRITYKSIÄ _____ KERTAA
- 13B. SAIRAALAHOITOJA ITSEMURHAYRITYKSEN VUOKSI
1. EI
 2. KYLLÄ, _____ KERTAA, MISSÄ _____, MILLOIN _____
14. AIEMMAT SUURET VAMMAT
1. EI
 2. ON, MIKÄ SUURIN _____ KOSKA TAPAHTUI V. _____
15. ALKOHOLIN VAIKUTUKSEN ALAISUUS AIEMMAN PAHIMMAN VAMMAUTUMISEN AIKANA
1. EI
 2. ON
 88. EI SOVELLU(ei aiempia vammoja)
- 16A. TUPAKOINTI
1. EI KOSKAAN
 2. KYLLÄ
- 16B. TUPAKOINTI (SÄÄNNÖLLINEN)VIIMEISEN KK:N AIKANA
1. EI
 2. KYLLÄ
- 16C. KUINKA PALJON TUPAKOINUT VIIM.KK.N AIKANA
1. VÄHEMMÄN KUIN 1 ASKI/VRK
 2. VÄHINTÄÄN ASKI /VRK

PALOVAMMAAN LIITTYVÄT ASIAT

17. LÄÄKITYS PALOVAMMAHETKELLÄ

1. EI
2. KYLLÄ, MIKÄ _____, ANNOSTELU _____
_____, ANNOSTELU _____

18. NYKYISEEN PALOVAMMAAN LIITTYVÄ TAHALLISUUS (ITSENSÄ VAHINGOITTAMISEN TARKOITUKSELLISUUS?)

1. EI
2. EPÄSELVÄ
3. ON, MINKÄLAINEN

19. PALOVAMMAAN LIITTYVÄ ITSETUHOINEN KUOLEMAN PYRKIMYS

1. EI
2. EPÄSELVÄ
3. ON

20. ITSEMURHAYRITYS-CASE [VÄH. TOINEN 18 TAI 19 ON SELVÄ(=3) JA TOINEN VÄH. EPÄSELVÄ(=2)]

1. EI
2. ON

21. ALKOHOLIN VAIKUTUKSEN ALAISENA NYKYISEN PALOVAMMAN TAPAHTUMAHETKELLÄ

1. EI
2. KYLLÄ

22. TUPAKOINTI PALOVAMMAN TAPAHTUMAHETKELLÄ

1. EI
2. KYLLÄ

23. SUBJEKTIIVINEN KOETTU ELÄMÄNLÄATU PALOVAMMAA EDELTÄVÄN KUUKAUDEN AIKANA

1. ERINOMAINEN
2. HYVÄ
3. KOHTALAINEN
4. HUONO

24. SOSIAALINEN SELVIYTYVYYS OMASTA MIELESTÄ PALOVAMMAA EDELTÄVÄN KUUKAUDEN AIKANA

1. ERINOMAINEN
2. HYVÄ
3. KOHTALAINEN
4. HUONO

PALOVAMMAN JÄLKEINEN TILANNE

25. SAATU PSYKIATRINEN HOITO PALOVAMMAN JÄLKEEN

1. EI PSYKIATRISTA HOITOÄ
2. PSYKIATRINEN KONSULTAATIO
3. KRIISIHOITO OSASTOLLA, JOKA SEURANNUT KONSULTAATIOITA
4. AVOHOITO HYKS PSYKIATRIAN PKL:LLA
5. AVOHOITO MUUALLA, MISSÄ _____ KUINKA KAUAN _____ JATKUU _____
6. SAIRAALAHOITO, MISSÄ _____ KOSKA _____ KUINKA MONTA _____

26. PSYYKELÄÄKITYS PALOVAMMAN JÄLKEEN

1. EI PSYYKELÄÄKITYSTÄ
2. ANTIDEPRESIIVINEN LÄÄKE, MIKÄ _____, ANNOS _____ KUINKA KAUAN _____
3. ANTIPSYKOOTTINEN LÄÄKE, MIKÄ _____, ANNOS _____ KUINKA KAUAN _____
4. MIELIALAA TASAAVA LÄÄKE, MIKÄ _____, ANNOS _____ KUINKA KAUAN _____
5. MUU, , MIKÄ _____, ANNOS _____ KUINKA KAUAN _____

27. PSYKOTERAPIA

1. EI
2. PSYKOTERAPEUTTINEN TUKI
3. ON SAANUT PSYKOTERAPIAIA
(koulutettu terapeutti, sopimus, säännöllisyys ja väh.1x/vko väh. kk:n ajan)

28. PALOVAMMAN JÄLKEINEN ITSETUHOISUUS

1. EI
2. ITSEMURHA-AJATUKSET(kliinisesti merkittävät)
3. ITSETUHOISET TEOT(imy>=1), MINKÄLAINEN _____

29. SUBJEKTIIVINEN KOETTU ELÄMÄNLÄATU 6KK PALOVAMMAN JÄLKEEN

1. ERINOMAINEN
2. HYVÄ
3. KOHTALAINEN
4. HUONO

30. SOSIAALINEN SELVIYTYYVYYS OMASTA MIELESTÄ PALOVAMMAA SEURANNEEN 6KK:N AIKANA

1. ERINOMAINEN
2. HYVÄ
3. KOHTALAINEN
4. HUONO

31. LEIKKAUSTEN LUKUMÄÄRÄ

1. 1
2. 2
3. 3 TAI ENEMMÄN
88. EI SOVELLU

32. OSASTOHOITOJEN LUKUMÄÄRÄ

1. 1
2. 2
3. 3 TAI ENEMMÄN

33. OSASTOHOITO VUOROKAUSIA TÖÖLÖN SAIRAALASSA PALOVAMMANHOIDON VUOKSI
1. 1 TAI ALLE 1
 2. 2-7
 3. 8-30
 4. 30-100
 5. YLI 100
34. SAIRASLOMAN PITUUS (VRK) PALOVAMMAN TAI SEN SEURAUKSIEN VUOKSI
1. EI LAISINKAAN
 2. 1-7
 3. 8-30
 4. 1-6 KK
35. PKL-KÄYNTIEN LUKUMÄÄRÄ TÖÖLÖSSÄ (OSASTOLLA TAI HUSUKE- PKL: LLA)
1. EI LAISINKAAN
 2. 1
 3. 2-5
 4. 6-
36. TARVINNUUT ULKOPUOLISTA KOTIHOITOAPUA
1. EI
 2. KYLLÄ
37. PALUU TYÖHÖN
1. EI MINKÄÄNLaiseen
 2. JOHONKIN ANSIOTYÖHÖN, MUTTEI ENTISEEN TYÖHÖN
 3. ENTISEEN ANSIOTYÖHÖNSÄ TAI OPISKELUUN
 88. EI SOVELLU (= ELÄKKEELLÄ TMS)
38. TYÖHÖN PALUUN ASTE
1. EI LAINKAAN
 2. OSA-AIKAINEN TAI KEVENNETTY ENTINEN TYÖ
 3. ENTINEN TYÖNKUVA JA TYÖPANOS
 88. EI SOVELLU (ESIM.ELÄKKEELLÄ)
39. KOSMEETTINEN HAITTA PALOVAMMASTA (SUBJEKTIIVISESTI KOETTU)
1. EI LAINKAAN
 2. VÄHÄN
 3. KOHTALAIESTI
 4. PALJON
40. TOIMINTAKYVYN HAITTA PALOVAMMASTA (TYÖ, VAPAA-AIKATOIMINNAT, HARRASTUKSET, SEKS. ELÄMÄ)
1. EI LAINKAAN
 2. VÄHÄN
 3. KOHTALAIESTI
 4. PALJON
41. TOIMINTAA RAJOITTAVA ARPIKIRISTYS
1. EI
 2. KYLLÄ

42. PALOVAMMAN SIJAINTI
1. KASVOT JA/ TAI PÄÄN ALUE
 2. DOMINANTIN KÄDEN TAI SORMIEN ALUE
 3. TOISEN KÄDEN TAI SORMIEN ALUE
 4. MUU YLÄRAAJAALUE
 5. JALKATERÄ
 6. MUU ALARAAJA- ALUE
 7. GENITAALIALUE
 8. MUU
43. TYÖTAPATURMA
1. EI
 2. KYLLÄ
44. TUPAKOINTI PALOVAMMAN JÄLKEEN 6 KK:N AIKANA
1. EI LAINKAAN
 2. VÄHENTYNYT
 3. ENNALLAAN
 4. LISÄÄNTYNYT
45. PALOVAMMAN NYKYHOITO
1. EI
 2. JATKUU MUUALLA KUIN TÖÖLÖSSÄ
 3. JATKUU TÖÖLÖSSÄ
46. PSYKIATRINEN HOITO
1. EI
 2. JATKUU HYKS TAI HUSISSA
 3. JATKUU MUUALLA
47. SUOSTUMUS MAHDOLLISEEN JATKOYHTEYDENOTTOON TUTKIMUKSEN VUOKSI
1. EI
 2. KYLLÄ

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