Sexual Dysfunction After Traumatic Brain Injury: an integrative review

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ABSTRACT

Introduction: Traumatic brain injury (TBI) is a major cause of morbidity and mortality in adults. Although sexuality issues following the lesions may cause a negative impact on rehabilitation, their epidemiological and treatment aspects are scarcely documented.

Objective: This review intends to assess the published studies on aspects of sexuality related to TBI.

Methods: This is an integrative review conducted in BVS and PubMed databases, during the period from 1980 and 2022, which presents the pathophysiology, incidence, methods of evaluation and treatment options of sexual dysfunction after TBI.

Results: There are few studies evaluating sexuality and TBI relation, and the epidemiological aspects are controversial. Articles stress that discussing sexual issues with the patient is still a taboo and the best approach to be taken is yet undefined.

Conclusion: Studies of sexuality in TBI patients are scarce, particularly on developing countries, such as Brazil. However, health professionals need to be aware of these matters, in order to better address the patient, improving his/her quality of life. Similarly, epidemiological studies on developing countries are of utmost importance.

Keywords: Traumatic brain injury; Sexuality; Sexual behavior

RESUMO

Introdução: O trauma cranioencefálico (TCE) é uma das principais causas de morbidade e mortalidade em adultos, podendo causar impacto negativo em aspectos relacionados à sexualidade. Objetivo: Nesta revisão, pretende-se avaliar os estudos publicados sobre aspectos da sexualidade em vítimas de TCE. Métodos: Trata-se de uma revisão integrativa realizada nas bases de dados BVS e PubMed, de 1980 a 2022, que apresenta a patofisiologia, incidência, métodos de avaliação e opções de tratamento para disfunção sexual após TCE. Resultados: Há escassez de estudos sobre sexualidade em doentes vítimas de TCE, não havendo acordo sobre sua incidência. Artigos demonstram que discutir esse assunto com os pacientes ainda é um tabu e a melhor abordagem para fazê-lo permanece indefinida. Conclusão: Os profissionais de saúde precisam estar cientes sobre tais problemas para melhor abordar o paciente, melhorando sua qualidade de vida. Estudos sobre sexualidade em TCE são necessários, especialmente os estudos epidemiológicos em países em desenvolvimento.

Palavras-chave: Traumatismo cranioencefálico; Sexualidade; Comportamento sexual

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INTRODUCTION

Sexuality is an important aspect of human life and goes beyond the sexual act itself, involving psychological, physiological and social characteristics, which reflect the physical and mental health of people. The term is not synonymous with intercourse and not merely the presence or absence of orgasm. Much more than that, it consists in a basic need, in thoughts, actions and interactions. Therefore, sexuality relates to physical and mental health, being an important marker of quality of life, motivating humans to seek satisfaction through contact, self-handling, welfare, orgasm, as well as by expressing affect and intimacy. After a traumatic brain injury (TBI), sexuality can be compromised, causing remarkable alterations, and thus negatively influencing the quality of life. However, this subject is rarely explored in the context of a person who suffered TBI, specially on non-developed and developing countries, where conversely, TBI is one of the leading causes of death and morbidity.

In Brazil, each year 500,000 people are hospitalized after TBI. A total of 75 to 100,000 people die a few hours after the event, whilst 70 to 90,000 progresses to an irreversible loss of some neurofunctional function. Due to its prevalence and the recognition of subtle disturbances even in patients with mild TBI, we decided to explore how sexuality is affected and addressed in such population. TBI can compromise both the “sexual performance” (in relation to physiological aspects of sexual performance) and the “sexual wellness” (which refers to the subjective sexual experience, for example, sexual satisfaction) of an individual. Therefore, in this review we intend to assess those topics and to disclose the current status of sexual disorders after TBI, reporting the pathophysiology, incidence, methods of evaluation and treatment options.

METHODS

The studies in this review included original articles (Randomized Clinical Trials, Non-Randomized Clinical Trials, cohorts, case-control, cross-sectional, and case series studies). Review articles and meta-analyses were not included. The population of the studies was composed of adults. The articles selected contained data on epidemiology, pathophysiology, assessment tools, and treatment for sexual dysfunction related to TBI.

RESULTS

The literature research was performed comprising the period from January 1980 to December 2022, using the Medical Subjects Heading (MeSH) terms: “traumatic brain injury”, “sexual dysfunction”, “erectile dysfunction” and “sexuality” in Biblioteca Virtual em Saúde (BVS) database and Pubmed. Additional research based on these MeSH terms was made in the periodicals “The Journal of Sexual Medicine”, “Archives of Sexual Behavior”, “International Journal of Impotence Research”, and “Journal of Sex Research”.

Two authors (review), independently, reviewed the articles by title and abstract. The full text was obtained for the article whose title appeared to meet the inclusion criteria. The study authors then reviewed all of the full-text articles and independently determined whether they met the inclusion criteria. The disagreements were resolved by discussion.

It was performed a research of literature comprising the period from January 1980 to May 2022, in order to know the landscape of scientific literature on “post-trauma Sexual dysfunction traumatic brain injury.” Literature review was performed in the Biblioteca Virtual em Saúde (BVS) crossing the keywords “Traumatismos encefálicos”, “Disfunção sexual”, “Função sexual”, “Disfunção erétil”, “Qualidade de vida” and “Sexualidade”. In the PubMed database, we crossed the descriptors “Traumatic brain Injury”, “Sexual dysfunction”, “Sexual functioning”, “Erectile dysfunction”, “Quality of life”, and “Sexuality”. Moreover, we made a manual search on the periodicals “The Journal of Sexual Medicine”, “Archives of Sexual Behavior”, “International Journal of Impotence Research”, and “Journal of Sex Research”, crossing the same referred descriptors. A search for additional articles was also made looking for the reference of relevant articles papers. The selection of articles was made by reading the titles and abstracts, being an exclusion criterion those papers not related to sexuality on TBI, review papers, and those not written in English or Portuguese.
Behavior, other three, but none had been selected. In search of the International Journal of Impotence Research and the Journal of Research, no article was found. At the end of the research, 33 articles were selected. These are analyzed in Table 1.

**Pathophysiology**

TBI can both, directly and indirectly, affect important aspects related to sexuality, after all, it involves different neurological parameters that include complex interactions between the neuroanatomical, neurochemical, neurophysiological, and neuropsychological systems. These contributions can be roughly distinguished in chemical messengers, spinal systems, brainstem-related structures, and cortical and subcortical systems. Neurotransmitters such as dopamine have been associated with sexual desire by excitatory influences including the mesolimbic and mesocortical pathways. Serotonin has an inhibitory effect on sexual function, as extensions of the spine have a crucial role in the sexual response such as erection, ejaculation, fertility, and lubrication. The centers of the brainstem, which are important for alertness and arousal, play a role in the emotional and orgasm answers, enabling the excitement. Subcortical areas such as the hypothalamus and the pituitary gland are important structures involving the control and execution of human sexual response, through the action of hormones that are involved in reproduction, sexual desire, and also lubrication. Finally, the upper cortical regions, such as the limbic and frontal lobe and paralimbic regions are important for the regulation of sexual behavior.

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**Incidence**

There is no consensus on the impact of changes in sexuality after TBI. Approximately 50-75% of individuals who have suffered TBI present cognitive and behavioral symptoms, and the consequences may occur even without motor or sensory sequelae, and the sexual behavior changes are serious complications. The overall incidence of sexual disturbances in TBI patients vary from 29 to 60%. Early after injury, sexual dysfunction is infrequent and occurs in less than 10% of patients.

Around 36-54% of sexual dysfunction after TBI is more prevalent in men with severe injuries. More than 50% of individuals suffering from TBI have decreased sexual arousal and women report more dyspareunia (genital pain during intercourse) and decreased vaginal lubrication. While men have more erectile and ejaculatory dysfunction, although, the prevalence is not well known.

One study investigated the incidence and types of sexual issues in men and women one year after TBI. The sample was comprised of 165 men and 58 women who have gone through the rehabilitation process and were living in their communities. Dissatisfaction with sexual functioning was reported (29%) mostly by men. In another study, 255 people with TBI (187 men and 68 women), one year after the injury that underwent hospitalization and rehabilitation, and were living in the community were investigated. They concluded that the variables age, female gender, and having more serious injuries were associated with worse sexual dysfunction. Both studies were prospective cohorts and used the scales Derogatis Interview for Sexual Functioning: Self-Report (DIFS-SR) and Global Sexual Satisfaction Index (GSSI).

However, not all studies report significant sexual dysfunction after TBI. A study examined the longitudinal changes in sexual functioning from 6 to 12 months after moderate and severe TBI through DIFS-SR and GSSI scales and evaluated 182 people (53 women and 129 men). After 6 months of trauma (72%) and 12 months after trauma (71%) subjects reported being satisfied with their sexual functioning, concluding that the sexual function and satisfaction appear to be stable in most of these subjects.

**Risk factors and associated diseases**

Sexuality can be influenced by neurological diseases and may lead to mood disorders, pain, paresis, loss of sensation, hypersensitivity, changes in sexual desire (which rarely happens to be hypersexuality, better known as an excessive sexual drive), anxiety, depression, musculoskeletal and self-image changes.

For example, lesions in the frontal region can generate apathy with decreased sexual desire, loss of pragmatic skills, self-neglect, and loss of interpersonal skills, interfering with sexual relationships. Different from what is stated above, a survey of 5 patients with high sex drive after TBI, states that this behavior is a complication that can occur after head injuries, and can be a source of great suffering for patients, partners, and close relatives.

The predictors generally reported of sexual dysfunction in TBI patients are older age, severe injuries, female gender, endocrine disorder, cognitive limitations, increased fatigue, depression, increased anxiety, changes in body image, motor limitations, and reduced self-esteem.
### Table 1. Selected papers and data.

<table>
<thead>
<tr>
<th>Author and date of publication</th>
<th>Paper</th>
<th>Journal</th>
<th>Study design (retrospective or prospective)</th>
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<th>Study design (descriptive, cohort, cross-sectional or case-control)</th>
<th>Scales applied</th>
<th>Sample Size</th>
<th>Population group (mild, moderate or severe TBI)</th>
<th>Sample Size Gender (M:F)</th>
<th>Conclusions</th>
</tr>
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<tbody>
<tr>
<td>Ter Mors et al. 2012</td>
<td>Evaluation of electrical aversion therapy for inappropriate sexual behaviour after traumatic brain injury: a single case study</td>
<td>BMJ Case Reports</td>
<td>Prospective</td>
<td>Prospective Descriptive Analysis through behavioral observations</td>
<td>Descriptive</td>
<td>Electrical aversion therapy (EAT)</td>
<td>1 (1M:0F)</td>
<td>Severe</td>
<td>The EAT (Electrical aversion therapy) if effective in reducing or eliminating inappropriate sexual behavior did not improve with conventional treatments.</td>
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<tr>
<td>Ponsford 2003</td>
<td>Sexual changes associated with traumatic brain injury</td>
<td>Neuropsychological Rehabilitation</td>
<td>Retrospective</td>
<td>Retrospective Case-control</td>
<td>Case-control</td>
<td>Structured questionnaire</td>
<td>208 (144M:64F)</td>
<td>Moderate and severe</td>
<td>Victims of TBI reported reduction in ability to give sexual satisfaction to the partner, decreased libido, self-esteem, communication and quality in the relationship.</td>
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<tr>
<td>Sandel et al. 1996</td>
<td>Sexual functioning following traumatic brain injury</td>
<td>Brain Injury</td>
<td>Retrospective</td>
<td>Retrospective Cross-sectional</td>
<td>Cross-sectional</td>
<td>Sexual function</td>
<td>52 (30M:13F)</td>
<td>Severe</td>
<td>Patients with lesions in the frontal lobe and right hemisphere reported higher levels of satisfaction and sexual functioning than those with other injuries, patients with more recent injuries reported higher arousal levels than those with longer lesions.</td>
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<tr>
<td>O'Carroll et al. 2001</td>
<td>Psychosexual and psychosocial sequelae of closed head injury</td>
<td>Brain Injury</td>
<td>Retrospective</td>
<td>Retrospective Cross-sectional</td>
<td>Cross-sectional</td>
<td>Golombok Rust Inventory of Sexual Satisfaction (GRISS), General Health Questionnaire (GHQ), Hospital Anxiety and Depression Scale (HAD)</td>
<td>36 (30M:6F)</td>
<td>Moderate and severe</td>
<td>Of patients suffering from TBI, 61% were classified with degrees of emotional distress, with a prevalence of symptoms of anxiety and depression that bring psychosocial losses.</td>
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<td>Aloni et al.(^{10}), 1999</td>
<td>Incidence of sexual dysfunction in TBI patients during the early post-traumatic in-patient rehabilitation phase</td>
<td>Brain Injury</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Interdisciplinary assessment team and structured interview</td>
<td>44 (44M:0F)</td>
<td>Severe</td>
<td>It is suggested that sexual dysfunction in TBI patients that appear during later stages of recovery are probably related to behavioral changes</td>
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<tr>
<td>Kreutzer et al.(^{11}), 1989</td>
<td>Psychosexual consequences of traumatic brain injury: methodology and preliminary findings</td>
<td>Brain Injury</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Systematic observation</td>
<td>21 (21M:0F)</td>
<td>Mild, moderate and severe</td>
<td>Male patients TBI victims have negative changes in sexual behavior, including decreased sexual desire, erectile function and frequency of sex, and emotional changes, including depression, decreased self-esteem and decline in personal sex appeal</td>
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<tr>
<td>Sander et al.(^{12}), 2012</td>
<td>Sexual Functioning 1 Year After Traumatic Brain Injury: Findings From a Prospective Traumatic Brain Injury Model Systems Collaborative Study</td>
<td>Archives of Physical Medicine and Rehabilitation</td>
<td>Prospective</td>
<td>Cohort</td>
<td>Derogatis Interview for Sexual Functioning-self-report (DISF-SR), Global Sexual Satisfaction Index (GSSI), structured interview regarding changes in sexual functioning, comfort level discussing sexuality with health care professionals</td>
<td>223 (165M:58F)</td>
<td>Moderate and severe</td>
<td>TBI victims with one-year injury time, living in their communities, had sexual difficulties after the evaluations. Thus, it is important to carry out interventions to improve the quality of sexual life of these people</td>
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<tr>
<td>Gaudet et al.(^{13}), 2001</td>
<td>Self-reported consequences of traumatic brain injury: a study of contrasting TBI and non-TBI participants</td>
<td>Sexuality and Disability</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Two Likert-type questionnaires: affective and behavioral</td>
<td>50 (26M:24F)</td>
<td>Mild, moderate and severe</td>
<td>TBI patients report having concerns about their cognition and aspects of sexuality, and men have greater concern</td>
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<tr>
<td>Sander et al.&quot;&quot;, 2013</td>
<td>Predictors of Sexual Functioning and Satisfaction</td>
<td>Journal Of Head Trauma Rehabilitation</td>
<td>Prospective</td>
<td>Cohort</td>
<td>Derogatis Interview for Sexual Functioning-Self-Report (DISF-SR), Global Satisfaction With Sexual Functioning (Global Sexual Satisfaction Index), Participation Assessment With Recombined Tools-Objective, Patient Health Questionnaire-9</td>
<td>255 (187M:68F)</td>
<td>Moderate and severe</td>
<td>The elderly and women appear to be at greater risk of sexual dysfunction after TBI and may benefit from assessment and specialist treatment services. They were identified relations between social participation and sexual function and between depression and sexual satisfaction, which can serve as indicators for future clinical assessments and interventions</td>
</tr>
<tr>
<td>Hanks et al.&quot;&quot;, 2013</td>
<td>Changes in Sexual Functioning From 6 to 12 Months Following Traumatic Brain Injury: A Prospective TBI Model System Multicenter Study</td>
<td>Journal of Head Trauma and Rehabilitation</td>
<td>Prospective</td>
<td>Cross-sectional</td>
<td>Derogatis Interview for Sexual Functioning-Self-Report (DIFS-SR), Global Sexual Satisfaction Index (GSSI)</td>
<td>182 (129M:53F)</td>
<td>Moderate and severe</td>
<td>Sexual function and sexual satisfaction may be stable in most of the victims of TBI, a fact that reinforces the importance of further studies in this field</td>
</tr>
<tr>
<td>Eghwrudjakpor et al.&quot;&quot;, 2008</td>
<td>Hypersexual Behavior Following Cranioencebral Trauma— an Experience with Five Cases</td>
<td>Libyan Journal Of Medicine</td>
<td>Prospective</td>
<td>Cross-sectional</td>
<td>Analysis through behavioral observations</td>
<td>5 (4M:1F)</td>
<td>Moderate and severe</td>
<td>Excessive sexual drive is a complication that can occur after head injuries, can be a source of great suffering, for patients and people with whom they share significant relationships</td>
</tr>
<tr>
<td>Strizzi et al.&quot;&quot;, 2015</td>
<td>Sexual functioning, desire, and Satisfaction in women with TBI and healthy controls</td>
<td>Behavioural Neurology</td>
<td>Prospective</td>
<td>Case-control</td>
<td>Sexual Quality of Life Questionnaire (SQuoL), Female Sexual Functioning Index (FSFI), Sexual Desire Inventory (SDI), Sexual Satisfaction Index (ISS)</td>
<td>29 (0M:29F)</td>
<td>Moderate and severe</td>
<td>Women victims of TBI have reduced sexual desire, arousal, orgasm, sexual satisfaction and lubrication, compared to healthy women</td>
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<tr>
<td>Moreno et al.¹¹, 2015</td>
<td>The Relationship Between Postconcussion Symptoms and Sexual Quality of Life in Individuals with Traumatic Brain Injury</td>
<td>Sexuality and Disability</td>
<td>Retrospective</td>
<td>Case-control</td>
<td>Sexual Quality of Life Questionnaire, and postconclusion symptoms with the Post-concussion Symptom Scale.</td>
<td>41 (18M:23F)</td>
<td>Moderate and severe</td>
<td>The current study shows that sexual quality of life is significantly lower in individuals with TBI than in matched healthy controls, and that there is a strong association between sexual quality of life and postconcussion symptoms in individuals with TBI.</td>
</tr>
<tr>
<td>Hibbard et al.¹⁸, 2000</td>
<td>Sexual dysfunction after traumatic brain injury</td>
<td>NeuroRehabilitation</td>
<td>Retrospective</td>
<td>Case-control</td>
<td>Semi structured interview</td>
<td>322 (193M:129F)</td>
<td>Moderate and severe</td>
<td>Individuals with TBI have physiological and emotional problems that impair sexual performance. The TBI men reported more difficulties to sustain an erection and symptoms of depression, while women reported more difficulty becoming sexually aroused, pain during sex or masturbation, hormonal changes and vaginal lubrication and depression.</td>
</tr>
<tr>
<td>Downing et al.¹⁹, 2013</td>
<td>Sexual changes in individuals with traumatic brain injury: a control comparison</td>
<td>The Journal Of Head Trauma Rehabilitation</td>
<td>Retrospective</td>
<td>Case-control</td>
<td>Brain Injury Questionnaire of Sexuality (BIQS), Hospital Anxiety and Depression Scale, Rosenberg Self-Esteem Scale</td>
<td>865 (608M:257F)</td>
<td>Moderate and severe</td>
<td>There was a significant difference related to sexual performance among participants with TBI and healthy, as after TBI subjects reported depression, anxiety, decreased self-esteem, fatigue, low confidence, pain and decreased mobility.</td>
</tr>
<tr>
<td>Ponsford et al.²⁰, 2013</td>
<td>Factors associated with sexuality following traumatic brain injury</td>
<td>The Journal Of Head Trauma Rehabilitation</td>
<td>Prospective</td>
<td>Case-control</td>
<td>Brain Injury Questionnaire of Sexuality (BIQS), Hospital Anxiety and Depression Scale, Rosenberg Self-Esteem Scale</td>
<td>986 (676M:310F)</td>
<td>Moderate and severe</td>
<td>Victims of TBI, sexual dysfunction most often are associated with depression, loss of self-esteem, social barriers to participation, reduction of sexual contact opportunities and impaired independence.</td>
</tr>
<tr>
<td>Simpson et al.²¹, 2013</td>
<td>Prevalence, clinical features, and correlates of inappropriate sexual behavior after traumatic brain injury: a multicenter study</td>
<td>The Journal Of Head Trauma Rehabilitation</td>
<td>Prospective</td>
<td>Cross-sectional</td>
<td>Overt Behavior Scale, Disability Rating Scale, Sydney Psychosocial Reintegration Scale-2, Health of the Nation Outcome Scale-Acquired Brain Injury, Care and Needs Scale</td>
<td>500 (250M:257F)</td>
<td>Severe</td>
<td>The prevalence and clinical characteristics of inappropriate sexual behavior. They represent a complex clinical challenge between a minority of patients with severe TBI.</td>
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<tr>
<td>James and Young, 2013</td>
<td>Clinical correlates of verbal aggression, physical aggression and inappropriate sexual behaviour after brain injury</td>
<td>European Journal Of General Practice</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Brain Injury Rehabilitation Trust (BIRT), Aggression Rating Scale, complementary measures of inappropriate sexual behavior</td>
<td>152</td>
<td>Mild, moderate and severe</td>
<td>Verbal aggression, physical aggression and inappropriate sexual behavior after an acquired brain injury (TBI among them) seem to reflect clinical phenomena separate instead of general deregulation of behavior.</td>
</tr>
<tr>
<td>Goldin et al., 2014</td>
<td>Sexual Functioning and the Effect of Fatigue in Traumatic Brain Injury</td>
<td>Journal of Head Trauma Rehabilitation</td>
<td>Prospective</td>
<td>Case-control</td>
<td>Fatigue Assessment Instrument, Global Fatigue Index, Beck Depression Inventory, SF-36 Health Survey.</td>
<td>220</td>
<td>Mild, moderate and severe</td>
<td>Fatigue affects more the performance of sexual activity for men and women with TBI than for those without brain injuries.</td>
</tr>
<tr>
<td>Simpson et al., 1999</td>
<td>Sex offending as a psychosocial sequela of traumatic brain injury</td>
<td>The Journal Of Head Trauma Rehabilitation</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Protocol to record data on demographic, injury, radiological and psychosocial variables and offensive behavior</td>
<td>445</td>
<td>Not specified</td>
<td>Sexual crimes are a significant clinical problem among a small minority of men after TBI (6.5% - n = 29).</td>
</tr>
<tr>
<td>Simpson and Long, 2004</td>
<td>An evaluation of sex education and information resources and their provision to adults with traumatic brain injury</td>
<td>The Journal Of Head Trauma Rehabilitation</td>
<td>Prospective</td>
<td>Cross-sectional</td>
<td>Two protocols with closed questions</td>
<td>49</td>
<td>Not specified</td>
<td>The resources of the sex education program were positively assessed by rehabilitation agencies and the community as a means to provide education and information to meet the sexual health concerns of people with TBI.</td>
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<tr>
<td>Gill et al., 2011</td>
<td>Exploring Experiences of Intimacy From the Viewpoint of Individuals With Traumatic Brain Injury and Their Partners (não possuí os dados que buscamos)</td>
<td>The Journal Of Head Trauma Rehabilitation</td>
<td>Retrospective</td>
<td>Semi structured interview</td>
<td>18 (12M:6F)</td>
<td>Not specified</td>
<td>After TBI can occur commitments related to sexuality, so health workers should be educated about the difficulties that the victims and their partners may have, and how to make appropriate referrals to help them.</td>
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<tr>
<td>Yang et al., 2018</td>
<td>Risk of Erectile Dysfunction After Traumatic Brain Injury: A Nationwide Population-Based Cohort study in Taiwan</td>
<td>American Journal of Men's Health</td>
<td>Retrospective</td>
<td>Cohort</td>
<td>Not specified</td>
<td>72,642 male patients who were diagnosed with TBI, and 217,872 patients without TBI</td>
<td>Mild, moderate and severe</td>
<td>patients with TBI are associated with a high risk of developing subsequent ED especially organic ED, in comparison to the controls.</td>
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<tr>
<td>Downing et al., 2018</td>
<td>Sexuality in individuals with traumatic brain injury and their partners.</td>
<td>Neuropsychological Rehabilitation</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Derogatis Interview for Sexual Function—Self-Report (DISF-SR)</td>
<td>55 couples</td>
<td>Mild, moderate and severe</td>
<td>It appears that individuals with TBI experience significant negative changes in sexual function, including problems with lubrication, as well as reduced sexual arousal. Sexual life can be adversely affected in males after severe TBI for both survivors and their partners. However, sexual dysfunction is only one part of the sexual difficulties observed in survivors.</td>
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<tr>
<td>Bivona et al., 2016</td>
<td>A biopsychosocial analysis of sexuality in adult males and their partners after severe traumatic brain injury</td>
<td>Brain Injury</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Sexual life was assessed with the Sexuality Evaluation Schedule Assessment Monitoring (SESAMO)</td>
<td>Twenty males with a history of severe TBI and 20 healthy controls (HC) and their respective partners</td>
<td>Severe</td>
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<tr>
<td>Moreno and McKerrall, 2017</td>
<td>Towards a taxonomy of sexuality following traumatic brain injury: A pilot exploratory study using cluster analysis</td>
<td>Neurehabilitation</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Sexual Quality of Life Questionnaire, and Sexual Desire Inventory (SDI-2)</td>
<td>19 M:23F</td>
<td>Mild, moderate and severe</td>
<td>The group of individuals with TBI showing sexual problems was older, showed lower levels of sexual quality of life and sexual desire, with significant symptoms of anxiety and depression.</td>
</tr>
<tr>
<td>Bellamkond and Zollman, 2014</td>
<td>Relationship Between Employment Status and Sexual Functioning After Traumatic Brain Injury</td>
<td>Brain injury</td>
<td>Retrospective</td>
<td>Cross-sectional</td>
<td>Derogatis Interview for Sexual Functioning Self Report (DISF-SR) sum and sub-scale scores, Global Sexual Satisfaction Index (GSSI).</td>
<td>95 M: 37F</td>
<td>mild, moderate or severe</td>
<td>The results of this study show a relationship between lower quality sexual functioning and satisfaction in persons with TBI and concomitant unemployment or lower annual income.</td>
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<tr>
<td>Author and date of publication</td>
<td>Paper</td>
<td>Journal</td>
<td>Study type (retrospective or prospective)</td>
<td>Study design (descriptive, cohort, cross-sectional or case-control)</td>
<td>Scales applied</td>
<td>Sample Size</td>
<td>Population group (mild, moderate or severe TBI)</td>
<td>Conclusions</td>
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<td>Simpson et al.20, 2001</td>
<td>Social, Neuroradiologic, Medical, and Neuropsychologic Correlates of Sexually Aberrant Behavior After Traumatic Brain Injury: A Controlled Study</td>
<td>The Journal of Head Trauma Rehabilitation</td>
<td>Retrospective</td>
<td>Case control</td>
<td>Not specified</td>
<td>25 males with f sexually aberrant behavior (SAB) after traumatic brain injury (TBI) and 25 males in control group</td>
<td>mild, moderate or severe</td>
<td>In the assessment, no relevant risk factors for the development of SAB were identified</td>
</tr>
<tr>
<td>Anto-Ocrah et al.33, 2019</td>
<td>Risk of Female Sexual Dysfunction Following Concussion in Women of Reproductive Age</td>
<td>Brain Injury</td>
<td>Prospective</td>
<td>Cohort</td>
<td>Brain Injury Questionnaire on Sexuality (BIQS)</td>
<td>31 female mild TBI (concussion)</td>
<td>Our results suggest that women who have a concussion have a significantly increased risk of sexual dysfunction compared to those who have an extremity injury. A history of previous concussions was also associated with current sexual dysfunction, further substantiating our hypothesis that concussion is associated with decreased sexual functioning.</td>
<td></td>
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<tr>
<td>Sander et al.34, 2016</td>
<td>Multicenter Study of Sexual Functioning in Spouses/Partners of Persons With Traumatic Brain Injury.</td>
<td>Archives of Physical Medicine and Rehabilitation</td>
<td>Retrospective</td>
<td>Cross sectional</td>
<td>Derogatis Interview for Sexual Functioning Self-Report; Global Sexual Satisfaction Index</td>
<td>70 couples mild, moderate or severe</td>
<td>Worse sexual functioning in spouses/partners was associated with older age and with worse sexual functioning in persons with TBI.</td>
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A study compared the sexuality of individuals with TBI and healthy people matched for age and sex with 865 participants with moderate to severe TBI were compared with 142 healthy people. A significant difference between participants with TBI and healthy people was found because the subject after TBI reported depression, anxiety, reduced self-esteem, fatigue, low confidence, pain and decreased mobility. In another study, 986 moderate to severe TBI patients were evaluated. Those patients with sexual dysfunction, in most cases, presented with depression, loss of self-esteem, barriers to social participation, reduction of sexual opportunities, and impaired independence. Both studies used the Brain Injury Sexuality Questionnaire (BISQ), Hospital Anxiety and Depression Scale, and Rosenberg Self-Esteem Scale.

In another study, 507 subjects with severe TBI were evaluated through the Overt Behavior Scale, Disability Rating Scale, Sydney Psychosocial Reintegration Scale-2, Health of the Nation Outcome Scale-Acquired Brain Injury, and Care and Needs Scale. The authors reported that occurred inappropriate sexual talk in 57.9% of cases, followed by touching and non-touching genital behavior (29.8%), and exhibitionism/public masturbation (10.5%)21.

In order to explore the relationships between verbal aggression, physical aggression, and inappropriate sexual behavior after TBI, a study reviewed 77 people that were hospitalized after Acquired Brain Injury (ABI), mostly caused by TBI (66%). The patients were evaluated with the Brain Injury Rehabilitation Trust (BIRT) and Aggression Rating Scale during hospitalization. They concluded that 46 of the 77 participants had verbal aggression, 26 showed aggressive behavior and 26 had inappropriate sexual behavior, however, no correlation between sexual disturbance and aggressive behavior was found.

A recent study evaluated 200 adults from a community who suffered mild TBI and 83 subjects without brain injury. The aim was to examine specific aspects of sexual functioning (like frequency, desired frequency, importance, and satisfaction) and its relationship with fatigue. They applied the Fatigue Assessment Instrument, Global Fatigue Index, Beck Depression Inventory, and SF-36 Health Survey. As a result, we have that several aspects of sexual activity (frequency, desired frequency, and importance) were closely related to the specific features of fatigue among individuals with TBI. Women with TBI reported less frequent and minor sex than men. In subjects without brain damage, the impact of fatigue was limited to the frequency of sexual activity, with no differences between the sexes. The authors concluded that fatigue plays a different role in the subjective experience of sexual activity for men and women with TBI than for those without brain damage.

The Forensic Psychiatry has also studied this subject, reporting that individuals after TBI have more convictions for sexual offenses such as pedophilia, exhibitionism, and compulsive sexual behavior. In a study evaluating 447 criminals with TBI, 6.5% (n = 29) committed some form of sexual crime.

**Assessment**

Sexual disorders after TBI is little discussed in the scientific literature and are complex to be evaluated. There are relationships between social participation and sexual function and between depression and sexual satisfaction, which can serve as clinical indicators for further evaluation and intervention. However, more research is needed to elucidate these relationships and to identify effective clinical approaches.

Given the importance and difficulty of identifying and effectively managing the issues of sexuality after TBI, an Australian study recruited 865 people who had suffered traumatic brain injury to participate in the validation of the "Brain Injury Questionnaire of Sexuality," a tool that assesses problems of sexuality after TBI. The evaluation method consists of applying a questionnaire with 18 questions that compare sexual activity before and after the injury.

Another study evaluated the features designed to meet the sexual health concerns of people with TBI in two different multidisciplinary services; 37 subjects who had suffered trauma within the past 12 months and living in the community, answered two protocols with closed questions. The result is that the services showed attention to sexual health concerns of individuals through Sex Education (guidelines and monitoring issues related to sex, free from prejudices and taboos). In addition, they found that the 4 issues most addressed were: what is sexuality, which is sexual dysfunction, such as meeting people, and how to work the sexual adjustment issues in the context of relations after TBI.

In a study evaluating 223 subjects (165 men and 58 women) who were admitted, discharged, and were living in the community, the scales applied were Derogatis Interview for Sexual Functioning-self-report (DISF-SR), Global Sexual Satisfaction Index (GSSI), and a structured interview referring changes in sexual functioning. The results showed that 68% of patients would talk freely about issues of sexual difficulties with health professionals, while the rest...
would talk only if asked, or not enter this subject. This reinforces the importance of providing education and information to address sexual concerns of people with TBI and education regarding the impact of TBI on intimacy should be integrated into rehabilitation. A conclusion was also reached by another recent study.

Treatment

There's no consensus on treatment for the different types of sexual dysfunction. One study reported the results of a functional analysis that showed inappropriate sexual behaviors exhibited by a boy, 9 years old, who had been diagnosed with TBI. They found a significant improvement after an intervention consisting of functional communication training and the extinction of inappropriate behavior.

The two strategies most used in the treatment of excessive sexual drive after TBI are psychotherapy, with an emphasis on the cognitive-behavioral model, and when this does not present satisfactory results, it is added a pharmacological approach, which often includes selective serotonin reuptake inhibitors, such as citalopram.

It is also suggested as a treatment, through the description of a clinical case, that “Electrical aversion therapy” (EAT) is a behavioral treatment option that can be used in people with severe TBI, including behavioral changes, and inappropriate sexual behavior, when other therapies are not effective.

Another study sought to explore through qualitative interviews intimacy experience from the point of view of 18 couples in which the companion suffered TBI (average of 4 years after injury) and living in the community with their partners. Factors that were perceived that helped the relationship were: unconditional commitment, spending time together, open communication, facing the difficulties caused by injury together, social support, family ties, spirituality, and the experience of overcoming difficulties. Factors that were perceived as barriers to intimacy included: emotional reactions to change, sexual difficulties, conflict and tension in the social role, family issues, social isolation, and communication problems. Thus, the study concludes that health professionals should be sensitized to the needs that people with TBI and their partners have about intimacy and how to make appropriate referrals to help them.

Another study explored the perceptions and experiences of rehabilitation professionals to discuss sexuality with users who have TBI. It included 24 professionals (6 men and 18 women) in two medical institutions treating victims of TBI. In each institution, arrangement was in 4 focus groups, using a semi-structured interview schedule. Focus group data were transcribed and analyzed using thematic analysis. Six main themes were obtained from the analysis: 1) Sexuality after TBI is a matter of expertise: this item refers to the participants’ perception that sexuality is a topic that requires specialized knowledge, skills, and training. Sometimes the lack of knowledge, skills, and experience prevented the professional to open sexuality discussions; 2) Sexuality is a sensitive subject: the subject relates to the participants’ perception that sexuality is a delicate issue that needs to be approached carefully to avoid discomfort; 3) Practical aspects of discussing sexuality: this theme refers to ‘difficulty’ (with a questionnaire, explanatory material, individually or in groups?), ‘when’ (beginning, middle, end of treatment or when the person bringing the theme?) and ‘where’ (in the institution?) to raise issues of sexuality with the victims; 4) Roles and responsibilities: this theme refers to the aspect of professionals putting or not putting themselves in the role to address the issue; 5) Dilemmas about risks and vulnerabilities: this theme refers to the risks and vulnerabilities that the subject can be placed if the sexuality issues are not addressed, for example, risks associated with sexual exploitation and unprotected sex; and 6) Organizational and structural issues: This theme refers to the organization and structure that offers the service to address the issue.

CONCLUSION

The incidence of TBI with sexual changes varies among studies as well as if sexual problems occur more frequently in men or in women, or whether the excessive sexual drive is common or not. It was noted that the greater the severity of the lesion and the age of the person, the greater the risk of developing sexual difficulties. As for evaluation, professionals lack instruments that can be used to evaluate and to conduct sexuality issues related to TBI, and usually do not address these problems.

Unfortunately, the study and intervention of sexual dysfunction after TBI is still a neglected field in literature, and sexuality issues remain largely unsolved through the rehabilitation process, especially in non-developed and developing countries. Further studies are necessary to elucidate the sexual dysfunctions presented by the affected population, in order to allow the advent of new treatment strategies that address their needs, thus enhancing sexual satisfaction and improving quality of life.
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