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Anxiety and depression among parents of children with mild head injuries

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Abstract. – OBJECTIVE: Parents who escort their children in hospital may present emotional disorders. Personnel pressure and reduced time availability often prevent their detection, reducing the efficacy of parental support. We aimed to identify the prevalence and assess the severity of anxiety and depression among parents of children with mild head injuries who were admitted for a 24-hour observation period in a pediatric hospital, and to detect possible determinants for the severe forms of the two emotional disorders.

PATIENTS AND METHODS: A cohort of 163 parents participated in our survey for anxiety and depression with the Hospital Anxiety and Depression Scale (HADS). Associations of the two disorders with factors of possible prognostic significance, such as gender, age, family status, residence, education, employment, and income were studied. Multinomial logistic regression analysis, with anxiety and depression of the parents as dependent variables, was performed.

RESULTS: More than half of parents presented clinical scores for both disorders. Female gender, distant residence, high school level education, unstable employment, and low income were determinants for severe anxiety. Depression in fathers was five times more likely to be severe than subclinical compared to mothers.

CONCLUSIONS: Psychological support and guidance of parents who escort their children with mild head injuries are mandatory. When accredited trauma support is not available, it is the hospital personnel who must identify and support these parents.

Key Words:
Anxiety, Depression, Mild head injury, Parents, HADS.

Introduction

Parental support is associated with less stress after a child's injury[1]. However, parents themselves are often in need of support. Hospital personnel pressure results in reduced time availability to detect any parental emotional disorders. Anxiety and depression may compromise the efficacy of parental care. Screening tests through structured interviews have been created to evaluate the severity of these disorders[2-4].

Head injuries lead among pediatric emergencies. They present an annual incidence of 180-300 new cases per 100,000 hospital admissions, corresponding to over 400,000 annual hospital visits in the United States[5,6]. Most (80-90%) are of minor severity[7,8]. Specifically, 81% are considered as mild, 8% as moderate, 6% as severe, and 5% as fatal[9]. Although mild head injuries are very common, they have not received the same attention compared to more severe types of cranial injuries, especially those resulting in admissions to intensive care units with neurological deficits[4].

The aim of this study is to identify the prevalence and assess the severity of anxiety and depression among parents of children who were admitted in the surgical department of a pediatric

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hospital with a mild head injury. It also aims to identify any prognostic factors for the detection of parents in need of support.

Patients and Methods

The Hospital Anxiety and Depression Scale (HADS) was used to measure anxiety and depression in a cohort of parents. Their children were admitted for mild head injuries in the surgical department of the Children's Hospital of Patras, Greece, under observation for 24 hours[10].

HADS scans and evaluates anxiety and depression through a self-assessment questionnaire of 14 questions. It is simple, concise, quick to complete, limited to the two disorders, and clearly distinguishes between them[10]. Participants were asked to respond on a four-point scale (from 0 to 3) of scoring. Sub-scale items were summed, with total scores ranging from 0 to 21. A cut-off score of >7 was indicative of clinically significant symptoms. Scores 8-11 were classified as moderate, and >11 as severe[10]. Though HADS is often used in patients with chronic diseases (i.e., cancer, asthma, autism) it has been also applied to healthy populations[11,12]. The HADS Greek version showed good psychometric properties (Cronbach's alpha coefficient 0.884, 0.829 for anxiety and 0.840 for depression)[13].

The term "mild head injury" refers to every head trauma with a Glasgow Coma Scale of 14-15 at the time of examination, occurring during the last 24 hours, with symptoms such as headache, vomiting, brief loss of consciousness, amnesia, and absence of focal neurological signs[14-17]. Herein, we used the term "mild" instead of "minor" to be in accordance with the latest classification guidelines of the Scandinavian Neurotrauma Committee[18]. Concussion (ICD-10-CM Code S06.0), currently referred as "mild traumatic brain injury" (MTBI) in literature, is included in the spectrum of mild head injuries[14,15].

The study was conducted from February 2017 to January 2018. The same researcher interviewed each parent one week after the traumatic incident during scheduled re-examination. Inclusion criteria to screen those parents eligible for participation were defined: i. each parent escorted only one child during their admission; ii. the age of children ranged between 6-15 years; iii. the inpatient period lasted 24 hours from admission to discharge; iv. the same parent performed both escorting during admission and post-hospital follow-up for one week; v. both parents and children did not present any history of known psychopathology or drug administration. Parents who returned home after clinical and radiological evaluation were excluded from the study. Information on age, gender, family status, number of children in the family, residence, education, employment status, financial annual income, and medical history were recorded.

Ethical approval for this study was granted by the Ethics Committee of the Children's Hospital of Patras; protocol number 4234/February 2017.

Statistical Analysis

A chi-square goodness of fit test, or an asymptotic Likelihood Ratio Test, in the case where more than 20% of cells had less than five expected counts, was applied to determine the correlation between two random variables. To compare the proportions in two cells, a binomial test was used, and Bonferroni's confidence intervals were constructed. Multinomial logistic regression analysis, with anxiety and depression of the parents as dependent variables, was performed with the aim to identify if any of the studied characteristics were determinants for the presentation of the two disorders.

The threshold for statistical significance was defined as $p<0.05$. Statistical analysis was made using IBM SPSS version 25 software (IBM Corp, Armonk, NY, USA).

Results

The study included 163 parents (40 fathers and 123 mothers). Participant age ranged 24-55 years [mean: 41.3 years, standard deviation (SD): 5.78 years]. Most participants were married (88.3%), had two children (49.1%), resided in urban areas (88.9%), and have completed high school (54.6%). More than 50% of the participants presented scores of clinical importance for anxiety (n=90, 55.2%) and depression (n=85, 52.2%), defined as moderate and severe grades of the scale (Table I). A gender-related variation was observed for anxiety ($p=0.016$). Mothers expressed more severe and less subclinical anxiety scores as opposed to fathers. Depression did not present any gender-related variations ($p=0.335$) (Table I).

Table II presents statistically significant associations of the two disorders with specific

Table I. Distribution of HADS scores of the parents who participated in the survey (n=163), by gender (chi-square goodness of fit test for independency). Moderate and severe grades are considered of clinical importance.

Grade (Score)	Anxiety (x^2 = 8.254, p = 0.016)			Depression (x^2 = 2.186, p = 0.335)		
	Total n (%)	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)
Low (0-7)	73 (44.8)	25 (62.5)	48 (39.0)	78 (47.9)	16 (40.0)	62 (50.4)
Moderate (8-10)	39 (23.9)	9 (22.5)	30 (24.4)	49 (30.1)	12 (30.0)	37 (30.1)
Severe (> 11)	51 (31.3)	6 (15.0)	45 (36.6)	36 (22.1)	12 (30.0)	24 (19.5)
Total	163 (100)	40 (100)	123 (100)	163 (100)	40 (100)	123 (100)

demographic and socio-economic parameters. The educational level of the parents was associated significantly both with anxiety (p<0.001) and depression (p=0.003). Moderate and severe anxiety scores were presented in parents of high school education. Parents with a university-level education presented more subclinical scores for both disorders (Table II). Participant employment status was found to relate to anxiety (p=0.001). Most full-time working parents did not present clinical anxiety scores. Housekeeping was associated with high scores for both disorders. Depression was not found to be associated with the employment status (p=0.062). Annual income was significant for both anxiety (p=0.001) and depression (p=0.008). The group of very low annual income showed clinical scores of anxiety and depression, as opposed to those with a higher one (Table II). We did not find any statistically significant differences among parental age, family status (i.e., married or divorced), number of family members, residence (urban or rural), and history of previous hospital admissions of their children for both anxiety and depression.

Multinomial logistic regression analysis with anxiety as the dependent variable and independent variables the studied characteristics showed that distance from healthcare facility (p=0.018), gender (p=0.036), educational level (p=0.002), employment status (p=0.008), and annual income (p=0.013) presented significant prognostic value (Table III). The multinomial logistic model fit our data well (Pearson chi-square 253.924, p=0.318) and the percentage of correct predictions was 64.8%. Extension of analysis to the three grades of anxiety as separate dependent variables showed that gender (p=0.015), employment status (p<0.001) and residence (p<0.001) were significant prognostic factors for the presentation of higher anxiety scores, i.e., mothers of unstable occupational status, who are

Table II. Statistically significant HADS scores in association with the demographic and socio-economic characteristics of the participants.

Characteristics	Anxiety n (%)				Depression n (%)			
	Low	Moderate	Severe	p	Low	Moderate	Severe	p
Education of Parents				**0.000**				**0.003**
Elementary school	6 (46.2)	1 (7.7)	6 (46.2)		2 (15.4)	5 (38.5)	6 (46.2)	
High school	3 (20.0)	2 (13.3)	10 (66.7)		7 (46.7)	4 (26.7)	4 (26.7)	
Senior high school	33 (37.1)	27 (30.3)	29 (32.6)		37 (41.6)	34 (38.2)	18 (20.2)	
University	31 (67.4)	9 (19.6)	6 (13.0)		32 (69.6)	6 (13.0)	8 (17.4)	
Employment status				**0.001**				**0.062**
Full-time	35 (63.6)	14 (25.5)	6 (10.9)		35 (63.6)	12 (21.8)	8 (14.5)	
Part-time	17 (39.5)	9 (20.9)	17 (39.5)		21 (48.8)	13 (30.2)	9 (20.9)	
Unemployed	11 (40.7)	8 (29.6)	8 (29.6)		10 (37.0)	8 (29.6)	9 (33.3)	
Housekeeping	10 (26.3)	8 (21.1)	20 (52.6)		12 (31.6)	16 (42.1)	10 (26.3)	
Annual income (euros)				**0.001**				**0.008**
0-6,000	33 (32.7)	27 (26.7)	41 (40.6)		39 (38.6)	36 (35.6)	26 (25.7)	
6,000-12,000	17 (58.6)	7 (24.1)	5 (17.2)		14 (48.3)	9 (31.0)	6 (20.7)	
> 12,000	23 (69.7)	5 (15.2)	5 (15.2)		25 (75.8)	4 (12.1)	4 (12.1)	

Table III. Statistical significance of variables for anxiety and depression based on likelihood ratio tests. Significant values are shown in bold characters (multinomial logistic regression).

Variables	Anxiety		Depression	
	chi-square	*p*	chi-square	*p*
Age of parent	3.023	0.221	0.526	0.769
Distance from healthcare service	15.250	0.018	9.364	0.154
Gender of parent	6.671	0.036	5.633	0.060
Family status	2.764	0.598	3.108	0.540
Residence	2.944	0.230	2.868	0.238
Educational level	20.920	0.002	7.274	0.296
Employment status	17.286	0.008	8.292	0.217
Annual income	12.602	0.013	3.987	0.408

distant residents from the healthcare facility will present severe compared to subclinical grades of anxiety.

According to statistical analysis, fathers are six times at risk to present subclinical than severe anxiety compared to mothers. Parents of high school education are 23 times more likely to present severe than subclinical anxiety compared to those of university level. Finally, parents with full-time employment are likely to present subclinical instead of moderate or severe anxiety, compared to parents of different occupational status.

When multinomial logistic regression analysis was performed for depression accordingly, it showed that there was no significant prognostic factor for the presentation of depression (Table III). This multinomial logistic model also fit our data well (Pearson chi-square 252.426, p=0.342), and the percentage of correct predictions was 61.7%. When the model was extended to the three grades of depression as dependent variables, only gender (p=0.022) appeared to be a significant prognostic factor for the presentation of severe depression, i.e., when fathers present depression, this would be of severe grade. The odds of fathers to present more severe than subclinical depression is five times greater than the odds of mothers.

Discussion

Mild head injuries in children are often considered of low impact value for the well-being of themselves and their families. There is an assumption that most children with mild head injuries will have a good recovery, and it is interesting that there are studies where these children served as controls[19,20]. Research regarding their psychological outcome has been limited and with ambiguous conclusions. On the contrary, a great number of publications exist on the impact of critical head trauma, where severe forms of anxiety and depression are reported in more than 50% of participants[21,22].

Literature search that we performed in the PubMed database with "HADS" and "parents" as given key words resulted in less than 90 publications. Most of these articles regarded the evaluation of anxiety and depression in situations related to severe and chronic diseases such as cancer, cystic fibrosis, asthma, diabetes mellitus, or mental and neurological disorders (epilepsy, anorexia nervosa, autism) among others.

Three research articles[11,23,24] used HADS to evaluate the result of traumatic brain injury to the children and their caregivers. Mbakile et al[11] used HADS in a sample of 18 caregivers (seven spouses, seven siblings and four parents) and resulted in a mean score of 7.50 points, SD=4.90 for anxiety, and 6.61 points, SD=4.15 for depression. While 14.3% of those with clinical anxiety were parents, none presented clinical depression in this study[11]. Hawley et al[23,24] performed a comparative postal survey in a population of children with mild head injury, among others with moderate and severe, and performed HADS evaluation of the injured patients, but not of their parents[23,24].

Our survey showed that clinical grades of anxiety and depression were found in a fair proportion of parents who escorted their children in hospital for a mild head injury. These parents, who presented the determinants shown in the Results Section, were those in need of support. Gender was proved an interesting parameter discriminating the different attitude of mothers and fathers

in emerging health crisis. Maternal anxiety, prevailing in the results of our study, is a disorder affecting mainly women throughout generations, reaching a peak during periods of crisis[25]. Paternal depression, which was expressed in more severe forms compared to mothers, has been well-studied through psychoanalysis[26]. Moreover, we should consider the fact that the survey was performed during a severe financial crisis in Greece.

To our knowledge, our survey was the first that used HADS for the evaluation of anxiety and depression of parents of children with mild head injury. This comprises the main novelty of the study, as it focused on two points often underrated in research: the parents and a type of head injury perceived as less important compared to more severe ones.

Limitations

There are certain limitations of our study. Mild head injury definition is equivocal and underrated compared to other categories of head trauma. Therefore, certain families are excluded from research activity. A second limitation is the self-evaluation nature of the survey. The participants may respond to some questions in a limited manner, influenced by perceived social acceptability. Finally, the study surveyed the parents of patients who stayed in hospital for 24 hours. However, a large proportion of children with a mild head injury either do not come to the emergency department or leave after clinical and radiological examination. Therefore, more extended research is needed for the extraction of conclusions of greater validity. A community-based research on the topic might be suitable.

Conclusions

Parents of children with a mild head injury may present clinical grades of anxiety and depression after the traumatic incident. Psychological support from the health-system is therefore mandatory. It should be desirable to have a psychologist available for these families in every pediatric trauma center. Medical and nursing personnel, beyond the care of the injured children, should anticipate the presentation of the two disorders in the parents. They should provide support during their short stay in hospital and guide them to proceed in the follow up period after their children's discharge.

Conflict of Interest
The Authors declare that they have no conflict of interests.

References

1) Williamson V, Creswell C, Butler I, Christie H, Halligan SL. Parental responses to child experiences of trauma following presentation at emergency departments: a qualitative study. BMH Open 2016; 6: e012944.
2) Foster K, Young A, Mitchell R, Van C, Curtis K. Experiences and needs of parents of critically injured children during the acute hospital phase: a qualitative investigation. Injury 2017; 48: 114-120.
3) Ogilvie R, Foster K, McCloughen A, Curtis K. Family members' experience of providing support for young people with traumatic physical injury during the acute hospital phase of care: a qualitative study. Injury 2015; 46: 1834-1840.
4) Verhaege S. Stress and coping among families of patients with traumatic brain injury: a review of the literature. J Clin Nurs 2005; 14:1004-1012.
5) Heskestad B, Baardsen R, Helseth E, Romner B, Waterloo K, Ingebrigtsen T. Incidence of hospital referred head injuries in Norway: a population-based survey from the Stavanger region. Scand J Trauma Resusc Emerg Med 2009; 17: 6.
6) Koepsell TD, Rivara FP, Vavilala MS, Wang J, Temkin N, Jaffe KM, Durbin DR. Incidence and descriptive epidemiologic features of traumatic brain injury in King County, Washington. Pediatrics 2011; 128: 946-954.
7) Cassidy JD, Carroll LJ, Peloso PM, Borg J, von Holst H, Holm L, Kraus J, Coronado VG; WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury. Incidence, risk factors and prevention of mild traumatic brain injury: results of the WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury. J Rehabil Med 2004; (43 Suppl): 28-60.
8) Andelic N, Anke A, Skandsen T, Sigurdardottir S, Sandhaug M, Ader T, Roe C. Incidence of hospital-admitted severe traumatic brain injury and in-hospital fatality in Norway: a national cohort study. Neuroepidemiology 2012; 38: 259-267.
9) Kraus JF. Epidemiological features of brain injury in children: occurrence, children at risk, causes and manner of injury, severity, and outcomes. In: Bronan SH, Michel ME (editors) Traumatic Head Injury in Children. New York, Oxford University Press; 1995: 22-39.
10) Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983; 67: 361-370.
11) Mbakile-Mahlanza L, Manderson L, Downing M, Ponsford J. Family caregiving of individuals with traumatic brain injury in Botswana. Disabil Rehabil 2017; 39: 559-567.

12) Ozdin S, Bayrak Ozdin S. Levels and predictors of anxiety, depression, and health anxiety during COVID-19 pandemic in Turkish society: the importance of gender. Int J Soc Psychiatry 2020; 20764020927051.

13) Michopoulos I, Douzenis A, Kalkavoura C, Christodoulou C, Michalopoulou P, Kalemi G, Fineti K, Patapis P, Protopapas K, Lykouras L. Hospital anxiety and depression scale (HADS): validation in a Greek general hospital sample. Ann Gen Psychiatry 2008; 7: 4.

14) McCrory P, Meeuwisse WH, Aubry M, Cantu B, Dvořák J, Echemendia RJ, Engebretsen L, Johnston K, Kutcher JS, Raftery M, Sills A, Benson BW, Davis GA, Ellenbogen RG, Guskiewicz K, Herring SA, Iverson GL, Jordan BD, Kissick J, McCrea M, McIntosh AS, Maddocks D, Makdissi M, Purcell L, Putukian M, Schneider K, Tator CH, Turner M. Consensus statement on concussion in sport: the 4th international conference on concussion in sport held in Zurich, November 2012. J Am Coll Surg 2013; 216: e55-71.

15) McCrory P, Meeuwisse WH, Aubry M, Cantu B, Dvořák J, Echemendia RJ, Engebretsen L, Johnston K, Kutcher JS, Raftery M, Sills A, Benson BW, Davis GA, Ellenbogen RG, Guskiewicz K, Herring SA, Iverson GL, Jordan BD, Kissick J, McCrea M, McIntosh AS, Maddocks D, Makdissi M, Purcell L, Putukian M, Schneider K, Tator CH, Turner M. Consensus statement on concussion in sport: the 4th international conference on concussion in sport held in Zurich, November 2012. Br J Sports Med 2013; 47: 250-258.

16) Kuppermann N, Holmes JF, Dayan PS, John D Hoyle Jr, Atabaki SM, Holubkov R, Nadel FM, Monroe D, Stanley RM, Borgialli DA, Badawy MK, Schunk JE, Quayle KS, Mahajan P, Lichenstein R, Lillis KA, Tunik MG, Jacobs ES, Callahan JM, Gorelick MH, Glass TF, Lee LK, Bachman MC, Cooper A, Powell EC, Gerardi MJ, Melville KA, Muizelaar JP, Wisner DH, Zuspan SJ, Dean JM, Wootton-Gorges SL, Pediatric Emergency Care Applied Research Network (PECARN). Identification of children at very low risk of clinically important brain injuries after head trauma: a prospective cohort study. Lancet 2009; 374:1160-1170.

17) Klassen TP, Reed MH, Stiell IG, Nijssen-Jordan C, Tenenbein M, Joubert G, Jarvis A, Baldwin G, St-Vil D, Pitters C, Belanger F, McConnell D, Vandemheen K, Hamilton MG, Sutcliffe T, Colbourne M. Variation in utilization of computed tomography scanning for the investigation of minor head trauma in children: a Canadian experience. Acad Emerg Med 2000; 7:739-744.

18) Astrand R, Roselund C, Undeh J. Scandinavian guidelines for initial management of minor and moderate head trauma in children. BMC Medicine 2016; 14: 33.

19) Knights RM, Ivan IP Ventureyra ECG, Bentivoglio C, Stoddart C, Winogron W, Bawden HN. The effects of head injury in children on neuropsychological and behavioural functioning. Brain Injury 1991; 5: 339-351.

20) Max JE, Roberts MA, Koele SL, Lindgren SD, Robin DA, Arndt S, Smith Jr WL, Sato Y. Cognitive outcome in children and adolescents following severe traumatic brain injury: influence of psychosocial, psychiatric, and injury-related variables. J Int Neuropsychol Soc 1999; 5: 58-68.

21) Douglas JM, Spellacy FJ. Correlates of depression in adults with severe traumatic brain injury and their carers. Brain Inj 2000; 14: 71-88.

22) Kolakowsky-Hayner SA, Kishore R. Caregiver functioning after traumatic injury. Neurorehabilitation 1999; 13: 27-33.

23) Hawley CA. Self-esteem in children after traumatic brain injury: an exploratory study. Neurorehabilitation 2012; 30: 173-181.

24) Hawley CA. Reported problems and their resolution following mild, moderate, and severe traumatic brain injury amongst children and adolescents in the UK. Brain Inj 2003; 17: 105-129.

25) Sydsjö G, Agnafors S, Bladh M, Josefsson A. Anxiety in women – a Swedish national three-generational cohort study. BMC Psychiatry 2018; 18:168.

26) Diamond MJ. When fathering fails: violence, narcissism, and the father function in ancient tales and clinical analysis. J Am Psychoanal Assoc 2018; 66: 7-40.