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Original Article

Pain, Anxiety, Depression, Fatigue, Sleep Quality, and Health-Related Quality of Life in the Mothers of Children with Autism Spectrum Disorder and Mothers of Typically Developing Children: A Case-Control Study

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ABSTRACT

BACKGROUND/AIMS: Special needs for children with autism spectrum disorder (ASD) increase the burden of caregiving which may cause several negative effects on the caregiver. The aim was to compare care burden, pain, anxiety, depression, fatigue, sleep quality, and health-related quality of life (HRQOL) in the mothers of children with ASD and typically developing children.

MATERIAL and METHODS: Children with ASD (n=35) and their mothers (n=35), and typically developing children (n=35) and their mothers (n=35) were recruited in this case-control study. Pain, anxiety/depression, fatigue, sleep quality, and HRQOL were assessed.

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RESULTS: There was no significant difference in most of the demographic characteristics of the children and mothers ($p>0.05$). The mothers of children with ASD had significantly greater care burden and anxiety level, and more impaired sleep quality and HRQOL ($p<0.05$). A nonsignificant difference was observed in depression, fatigue, and pain between the mothers of children with ASD and those with typically developing children ($p>0.05$).

CONCLUSION: It was found that mothers of children with ASD had higher care burden and anxiety levels, lower sleep quality and HRQOL compared to mothers of typically developing children. However, there was no significant difference between the two groups in terms of pain, fatigue, and depression levels.

Keywords: autism spectrum disorder; mother; caregiver; children; pain; quality of life

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Otizm spektrum bozukluğu olan çocukların annelerinde ve tipik gelişim gösteren çocukların annelerinde ağrı, anksiyete, depresyon, yorgunluk, uyku kalitesi ve sağlıkla ilişkili yaşam kalitesi: olgu kontrol çalışması

ÖZ

AMAÇ: Otizm spektrum bozukluğu (OSB) olan çocukların özel ihtiyaçları, bakım yükünü artırarak bakım verenler üzerinde çeşitli olumsuz etkilere neden olabilir. Bu çalışmanın amacı, OSB'li ve tipik gelişim gösteren çocukların annelerinde bakım yükü, ağrı, anksiyete, depresyon, yorgunluk, uyku kalitesi ve sağlıkla ilişkili yaşam kalitesini karşılaştırmaktır.

GEREÇ ve YÖNTEMLER: Bu olgu kontrol çalışmasına OSB'li çocuklarla (n=35) anneleri (n=35) ve tipik gelişim gösteren çocuklarla (n=35) anneleri (n=35) dahil edildi. Ağrı, anksiyete/depresyon, yorgunluk, uyku kalitesi ve sağlıkla ilişkili yaşam kalitesi değerlendirildi.

BULGULAR: Çocukların ve annelerin demografik özelliklerinin çoğunda anlamlı bir fark yoktu ($p>0.05$). OSB'li çocukların annelerinin bakım yükü ve anksiyete düzeyi anlamlı derecede yüksek, uyku kalitesi ve sağlıkla ilişkili yaşam kalitesiyse anlamlı derecede daha düşüktü ($p<0.05$). OSB'li çocukların anneleri ile tipik gelişim gösteren çocukların anneleri arasında depresyon, yorgunluk ve ağrı düzeyleri açısından anlamlı fark gözlenmedi ($p>0.05$).

SONUÇ: Tipik gelişim gösteren çocukların annelerine kıyasla OSB'li çocukların

annelerinde daha fazla bakım yükü ve anksiyete düzeyi, daha düşük uyku kalitesi ve

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sağlıkla ilişkili yaşam kalitesi olduğu saptandı. Ancak iki grup arasında ağrı, yorgunluk ve depresyon düzeyleri açısından anlamlı bir fark olmadığı saptandı.

Anahtar Kelimeler: otizm spektrum bozukluğu; anne; bakım veren; çocuk; ağrı; yaşam kalitesi

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MAIN POINTS

- Special needs for children with autism spectrum disorder increase the burden of caregiving.
- Mothers of children with autism spectrum disorder have greater care burden and anxiety levels, less sleep quality, and health-related quality of life.
- Levels of pain, fatigue, and depressive symptoms are not significantly different between the mothers of children with and without autism spectrum disorder.

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INTRODUCTION

Developmental disabilities include various cognitive and physical disorders that occur in early childhood and remain throughout life (1). Developmental disabilities such as autism spectrum disorder (ASD) have an increasing prevalence (2). These children with developmental disabilities commonly require significant help during performing many activities of daily living (2). These elevated special needs generate significant changes in family dynamics and increase the burden of caregiving commonly supplied by biological mothers (3-5).

The caregiver's problems can affect the continuous interaction between them and their children (6). Therefore, it is important to know a caregiver's health status to provide better treatment to an impaired child. Previous studies showed that the caregivers of children with intellectual and developmental disabilities have more levels of anxiety and depression compared to the caregivers of children without such disabilities or the general population (1, 7-9). There is cumulative evidence that the caregivers of such children have a lower health-related quality of life (HRQOL) (2, 4, 5, 10).

Chronic pain is commonly co-morbid with a depressive or anxiety disorder which can exacerbate the pain perception (11, 12). Although it is known that the caregivers of children with developmental disabilities experience more anxiety and depression (1, 7-9), the interaction between these problems and other related issues such as pain, fatigue, and sleep quality is not clear. A previous study investigated the HRQOL in the caregivers

of children with intellectual disability using the 5-level EQ-5D which includes five

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dimensions related to the level of perceived problems including pain/discomfort and anxiety/depression (10). It was reported that 49.7% of the caregivers had pain/discomfort problems and 54.3% of them had anxiety/depression problems (10). However, that study focused on pain/discomfort and anxiety/depression problems related to HRQOL without assessing them directly (10). However, direct assessments are required to obtain a better understanding. For example, a recent study has reported that having intellectual disability in children with cerebral palsy increases pain and disability related to low back and neck in the caregivers (13). Our study aimed to compare the care burden, pain, anxiety, depression, fatigue, sleep quality, and HRQOL in the mothers of children with ASD and mothers of typically developing children. We hypothesized that the mothers of children with ASD would have significantly greater levels of care burden, pain, anxiety, depression, and fatigue; and less levels of sleep quality and HRQOL compared to the mothers of typically developing children.

MATERIAL and METHODS

Study design and participants

This study had a case-control design. The children diagnosed as having an ASD according to the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (14) and their primary caregivers were recruited from a special education and rehabilitation center located in Lefkosa, Turkish Republic of Northern Cyprus. The typically developing children (without a physician-diagnosed chronic disease) and their

primary caregivers living in the same city were recruited from the friends, families, and

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neighborhood of the researchers. Inclusion criteria for caregivers were being the biological mother and primary caregiver of the child. We included only the mothers since due to the cultural considerations, mothers are generally the primary caregivers of the children. The mothers with a physician-diagnosed chronic disease (neurological, systemic, metabolic, etc.), a history of operation within 6 months, and having pregnancy were excluded.

The required sample size was calculated as 54 participants with their children (27 for each group) according to achieve the effect size=0.78, power=80%, and alpha error probability=0.05 using G*Power (Ver. 3.1.9.4, Dusseldorf University, Germany) (15, 16).

The study was approved by the Ethics Review Board of “**MASKED**” University approval number: “**MASKED**” and date: “**MASKED**”) and performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki (as revised in Brazil 2013). All mothers gave informed consent for themselves and their children before entering the study.

Outcome measures

Demographic characteristics [gender, body mass index (BMI), education level, and the number of children] of the mothers and children were obtained.

The Zarit Burden Interview (ZBI) was used to assess the distress experienced by the caregivers due to caring for their children. The ZBI consists of 22 items having a 5-point

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scale where the higher scores indicate a higher burden. The ZBI was found to be a valid and reliable scale to be used within the Turkish population (17).

The McGill Pain Questionnaire (MPQ) was used to assess the pain experience of the caregivers (18). The MPQ includes three parts. In the first part, the participants mark their painful sites. The second part is a verbal descriptive scale related to the intensity level of the current pain. The third part consists of 72 descriptive adjectives related to pain. A cumulative total score was calculated, and higher scores indicate more pain experience. The Turkish version of the MPQ was found as a reliable and valid measure (19).

The Nordic Musculoskeletal Questionnaire (NMQ) was used to determine the prevalence of pain in different body regions within the last year and week. The NMQ has a dichotomous option for each body part and gives a prevalence rate for each body region instead of a cumulative score (20, 21). The NMQ was translated into Turkish, and this version was found as reliable and valid (20).

The Fatigue Severity Scale (FSS) was used to assess fatigue severity (22). The FSS includes 9 items having a 7-point scale and higher scores represent greater fatigue severity. The Turkish version of FSS was found to be reliable and valid (22). A cut-off score of 4 or more was considered indicative of problematic fatigue (23).

The Hospital Anxiety and Depression Scale (HADS) was used to assess the level of anxiety and depressive symptoms. It consists of two subscales: HADS-Anxiety and HADS-Depression with each subscale have 7 items with a response-scale with four

alternatives (from 0 to 3) (24, 25). The Turkish version of the HADS was also found as a

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valid and reliable measure (26). The cutoff points of the Turkish version were 10 for the HADS-Anxiety and 7 for the HADS-Depression (26).

The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality (27). The PSQI has 19 items with a 0-3 interval scale and lower scores indicate a healthier sleep quality. The Turkish version of the PSQI was found to be valid and reliable (28).

The Nottingham Health Profile (NHP) was used to assess HRQOL (29). The NHP consists of 38 items with yes/no answer options and each section score is weighted. The NHP has 6 different subscale scores and the higher the score, the lower the HRQOL. The Turkish version of the NHP was found to be valid and reliable (30).

Statistical analysis

The Kolmogorov–Smirnov test and histograms were used to investigate the normal distribution of data. Mann-Whitney *U* test and chi-square test were conducted to compare the difference between the study groups. Effect sizes were calculated as Cohen’s *d* (31). Statistical significance was set at $p < 0.05$. Statistical analyses were conducted using the IBM SPSS Statistics for Windows (Version 24.0. Armonk, NY: IBM Corp.).

RESULTS

In total, 70 mothers and 70 children participated in this study. No significant difference was observed in age, BMI, number of children, and education level between the mothers of children with ASD and typically developing children ($p > 0.05$) (Table 1). There were significantly more males in children with ASD ($p < 0.05$). No significant difference was

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observed in age, BMI, and education level between the children with ASD and typically developing children ($p>0.05$) (Table 2).

The mothers of children with ASD had significantly greater ZBI, PSQI, HADS-Anxiety, NHP-Energy, NHP-Emotional reaction, and NHP-Social isolation scores compared to the mothers of typically developing children ($p<0.05$). No significant difference was observed in the remaining study variables ($p>0.05$). Table 3 presents the comparison statistics of care burden, pain, fatigue, sleep quality, anxiety, depression, and HRQOL between the mothers of children with ASD and those with typically developing children. The most common musculoskeletal pain sites during the last year and last week were upper back and neck in both the mothers of children with ASD and those with typically developing children. No significant difference was observed in the presence of musculoskeletal pain sites during the last year and last week between the mothers of children with ASD and those with typically developing children ($p>0.05$). The details are presented in Table 4.

DISCUSSION

The study hypothesis was that the mothers of children with ASD would have significantly greater levels of care burden, pain, anxiety, depression, and fatigue; and less levels of sleep quality and HRQOL compared to the mothers of typically developing children. The main findings were that the mothers of children with ASD had greater care burden and anxiety levels, and less sleep quality, and HRQOL.

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Although the mothers of children with ASD had greater anxiety levels, there was no significant difference between the number of individuals with anxiety determined by published cutoff values between the mothers of children with ASD and the mother of typically developing children (26). This finding should be interpreted with caution. The mothers of children with ASD had relatively high anxiety (14.3%) and depression (42.9%) prevalence in our study. However, mothers with typically developing children had also relatively high anxiety (8.6%) and depression (37.1%) prevalence. Almansour et al. found that the caregivers of children with ASD had significantly more anxiety/depression disorders compared to the controls; and 32% of the caregivers of children with ASD had anxiety/depression, whereas the controls had 2% (32). Ingersoll et al. reported similar results that 44% of the mothers of children with ASD had depression and this ratio was 30% in the controls (33). Similarly, other studies also reported significant differences between the caregivers of children with ASD and controls in terms of depression/anxiety (34, 35). The depression/anxiety rates in the mothers of children with ASD in our study are similar to the previous studies. However, due to the high rate of depression/anxiety in the mothers of typically developing children, the difference did not reach a significance level. This difference might be related to outcome measures, cutoff values, and sample sizes. In addition, cultural differences can also play notable role on this difference as the aforementioned studies were conducted in China, Singapore, Saudi Arabia, and the USA (32-35). On the other hand, a study conducted in

Iran reported no significant difference between the mothers of children with ASD and

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controls in terms of depression levels, whereas anxiety/insomnia levels were significantly different (36). We also found that anxiety and sleep quality were significantly different, whereas depression levels were not. We believe that similar results can be attributed to the similarities between the two studies such as similar geography and a similar study sample (32 mothers of children with ASD and 29 mothers of children without ASD) (36). We expected that if the mothers of children with ASD had greater anxiety/depression, they would have greater pain experience. However, since there was no such a large difference in anxiety/depression, the pain scores (direct assessment and related to HRQOL) were not significantly different. In addition, no significant difference was observed in the musculoskeletal pain sites between the mothers of children with ASD and those with typically developing children. However, one should keep in mind that this finding does not mean that these problems are few in this population as in our study, 62.9% of the mothers of children with ASD reported upper back pain, 51.4% reported neck pain, and 45.7% reported low back and shoulder pain. In a previous study, although the pain symptoms were not directly assessed, it was reported that 49.7% of the caregivers of children with intellectual disability had pain/discomfort problems (10). The health professionals working with children with ASD should consider referring their mothers to further assessment and rehabilitation programs for musculoskeletal pain management.

There is cumulative evidence that the caregivers of children with developmental disorders have lower HRQOL (2, 4, 5, 10). Our results are consistent with the previous reports. We

found that most of the subdomains of HRQOL (energy, emotional reaction, and social

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isolation) were significantly lower in the mothers of children with ASD compared to the mothers of typically developing children. On the other hand, there was a nonsignificant difference in pain, sleep, and mobility subdomains of HRQOL. Indeed, one could expect that due to the observed significant difference in sleep quality, the mothers of children with ASD would have impaired sleep subdomain of HRQOL. The median of the sleep subdomain was 12.6 in the mothers of children with ASD, whereas it was 0 in the mothers of typically developing children. The nonsignificant difference might be related to the small sample size. However, the observed small effect size suggests that the nonsignificant difference would be similar in a large sample size. Therefore, the results show that statistically significant sleep quality impairment does not cause a significant decrease in the sleep subdomain of HRQOL in the mothers of children with ASD.

There are many limitations to our study. First, although we conducted a-priori sample size calculation, our sample size was relatively small. Second, we only included the mothers that it decreases the generalizability of the findings. The inclusion of other family members such as fathers, grandmothers, grandfathers, and siblings would reflect the family impact better. Last, due to the cross-sectional design of our study, we cannot give information about the change with time or show possible factors contributing towards the assessed variables which are mostly time-dependent and context-dependent conditions. Therefore, future longitudinal studies are required. Despite these limitations, our study

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had strength in assessing pain, fatigue, and sleep quality directly. Our results would provide valuable information regarding sample size calculations for future studies.

The mothers of children with ASD had greater care burden and anxiety levels; and less sleep quality and HRQOL related to energy, emotional reaction, and social isolation. Compared to the mothers of typically developing children, the mothers of children with ASD did not have significantly different pain, fatigue, and depression levels. However, one should keep in mind that these problems were relatively high in both groups.

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REFERENCES

1. Scherer N, Verhey I, Kuper H. Depression and anxiety in parents of children with intellectual and developmental disabilities: A systematic review and meta-analysis. PLoS One. 2019;14(7):e0219888.
2. Barros ALO, de Gutierrez GM, Barros AO, Santos M. Quality of life and burden of caregivers of children and adolescents with disabilities. Special care in dentistry : official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry. 2019;39(4):380-8.
3. Volkmar F, Siegel M, Woodbury-Smith M, King B, McCracken J, State M, et al. Practice parameter for the assessment and treatment of children and adolescents with autism spectrum disorder. Journal of the American Academy of Child and Adolescent Psychiatry. 2014;53(2):237-57.
4. Isa SN, Ishak I, Ab Rahman A, Mohd Saat NZ, Che Din N, Lubis SH, et al. Health and quality of life among the caregivers of children with disabilities: A review of literature. Asian journal of psychiatry. 2016;23:71-7.
5. Ten Hoopen LW, de Nijs PFA, Duvekot J, Greaves-Lord K, Hillegers MHJ, Brouwer WBF, et al. Children with an Autism Spectrum Disorder and Their Caregivers: Capturing Health-Related and Care-Related Quality of Life. Journal of autism and developmental disorders. 2020;50(1):263-77.
6. Rodriguez G, Hartley SL, Bolt D. Transactional Relations Between Parenting Stress and Child Autism Symptoms and Behavior Problems. Journal of autism and developmental disorders. 2019;49(5):1887-98.

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7. Falk NH, Norris K, Quinn MG. The factors predicting stress, anxiety and depression in the parents of children with autism. *Journal of autism and developmental disorders*. 2014;44(12):3185-203.
8. Machado Junior SB, Celestino MI, Serra JP, Caron J, Ponde MP. Risk and protective factors for symptoms of anxiety and depression in parents of children with autism spectrum disorder. *Dev Neurorehabil*. 2016;19(3):146-53.
9. Barker ET, Hartley SL, Seltzer MM, Floyd FJ, Greenberg JS, Orsmond GI. Trajectories of emotional well-being in mothers of adolescents and adults with autism. *Dev Psychol*. 2011;47(2):551-61.
10. Arora S, Goodall S, Viney R, Einfeld S, team M. Health-related quality of life amongst primary caregivers of children with intellectual disability. *Journal of intellectual disability research : JIDR*. 2020;64(2):103-16.
11. de Heer EW, Gerrits MM, Beekman AT, Dekker J, van Marwijk HW, de Waal MW, et al. The association of depression and anxiety with pain: a study from NESDA. *PLoS One*. 2014;9(10):e106907.
12. Woo AK. Depression and Anxiety in Pain. *Rev Pain*. 2010;4(1):8-12.
13. Gokcin Eminel A, Kahraman T, Genc A. Physical workload during caregiving activities and related factors among the caregivers of children with cerebral palsy. *Irish Journal of Medical Science (1971 -)*. 2020.
14. Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.

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15. Kaya K, Unsal-Delialioglu S, Ordu-Gokkaya NK, Ozisler Z, Ergun N, Ozel S, et al. Musculo-skeletal pain, quality of life and depression in mothers of children with cerebral palsy. *Disabil Rehabil.* 2010;32(20):1666-72.
16. Faul F, Erdfelder E, Lang A-G, Buchner A. G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods.* 2007;39(2):175-91.
17. Özlü A, Yıldız M, Aker T. Zarit Bakıcı Yük Ölçeğinin Şizofreni Hasta Yakınlarında Geçerlilik ve Güvenilirlik Çalışması. *Archives of Neuropsychiatry/Noropsikiatri Arsivi.* 2009;46.
18. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. *Pain.* 1975;1(3):277-99.
19. Oksuz E, Malhan S, Tulunay F. Turkish McGill Pain Questionnaire: reliability and validation. *Value in Health.* 2007;10(6):A467.
20. Kahraman T, Genc A, Goz E. The Nordic Musculoskeletal Questionnaire: cross-cultural adaptation into Turkish assessing its psychometric properties. *Disabil Rehabil.* 2016;38(21):2153-60.
21. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sorensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied ergonomics.* 1987;18(3):233-7.
22. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. *Arch Neurol.* 1989;46(10):1121-3.

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23. Lerdal A. Fatigue Severity Scale. In: Michalos AC, editor. Encyclopedia of Quality of Life and Well-Being Research. Dordrecht: Springer Netherlands; 2014. p. 2218-21.
24. Snaith RP. The Hospital Anxiety And Depression Scale. Health Qual Life Outcomes. 2003;1:29.
25. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta psychiatrica Scandinavica. 1983;67(6):361-70.
26. Aydemir Ö, Guvenir T, Kuey L, Kultur S. Validity and reliability of Turkish version of hospital anxiety and depression scale. Turk Psikiyatri Derg. 1997;8(4):280-7.
27. Buysse DJ, Reynolds CF, 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193-213.
28. Ağargün MY, Kara H, Anlar Ö. The validity and reliability of the Pittsburgh Sleep Quality Index. Turkish Journal of Psychiatry. 1996;7(2).
29. Hunt SM, McKenna SP, McEwen J, Backett EM, Williams J, Papp E. A quantitative approach to perceived health status: a validation study. J Epidemiol Community Health. 1980;34(4):281-6.
30. Kucukdeveci AA, McKenna SP, Kutlay S, Gursel Y, Whalley D, Arasil T. The development and psychometric assessment of the Turkish version of the Nottingham Health Profile. International journal of rehabilitation research Internationale Zeitschrift fur Rehabilitationsforschung Revue internationale de recherches de readaptation. 2000;23(1):31-8.
31. Lenhard W, Lenhard A. Calculation of effect sizes. Dettelbach, Germany: Psychometrica; 2016, https://www.psychometrica.de/effect_size.html.

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32. Almansour MA, Alateeq MA, Alzahrani MK, Algeffari MA, Alhomaïdan HT. Depression and anxiety among parents and caregivers of autistic spectral disorder children. *Neurosciences*. 2013;18(1):58-63.
33. Ingersoll B, Meyer K, Becker MW. Increased rates of depressed mood in mothers of children with ASD associated with the presence of the broader autism phenotype. *Autism Res*. 2011;4(2):143-8.
34. Gong Y, Du Y, Li H, Zhang X, An Y, Wu BL. Parenting stress and affective symptoms in parents of autistic children. *Science China Life sciences*. 2015;58(10):1036-43.
35. Lai WW, Goh TJ, Oei TP, Sung M. Coping and Well-Being in Parents of Children with Autism Spectrum Disorders (ASD). *Journal of autism and developmental disorders*. 2015;45(8):2582-93.
36. Riahi F, Izadi-Mazidi S. Comparison between the mental health of mothers of children with autism and control group. *Iran J Psychiatry Behav Sci*. 2012;6(2):91-5.

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Table 1. Demographic characteristics of the mothers of children with ASD and typically developing children			
	Mothers of children with ASD (n=35)	Mothers of typically developing children (n=35)	<i>p</i>
Age (years) ^a	35 (31-41)	34 (29-41)	0.879
BMI (kg/m ²) ^a	22.4 (20.8-25.5)	23 (20.8-28.7)	0.385
Number of children ^a	2 (1-2)	2 (1-2)	0.497
Education level			
Secondary school ^b	17 (48.6)	6 (17.1)	0.775
High school ^b	10 (28.6)	13 (37.1)	
University ^b	8 (22.9)	16 (45.7)	
^a Median (interquartile range), analysed with Mann-Whitney <i>U</i> test.			
^b Number of participants, analysed with chi-square test.			
ASD, autism spectrum disorder; BMI, body mass index.			

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Table 2. Demographic characteristics of the children with ASD and typically developing children			
	Children with ASD (n=35)	Typically developing children (n=35)	<i>p</i>
Age (years) ^a	7 (5-9)	8 (4-12)	0.331
Gender			
Female ^b	9 (25.7)	17 (48.6)	0.048*
Male ^b	26 (74.3)	18 (51.4)	
BMI (kg/m ²) ^a	19.0 (16.6-24.1)	18.5 (15-21.6)	0.312
Education level			
Preschool ^b	17 (48.6)	11 (31.4)	0.054
Primary school ^b	15 (42.9)	15 (42.9)	
Secondary school ^b	3 (8.6)	8 (22.9)	
High school ^b	0	1 (2.9)	
* <i>p</i> <0.05			
^a Median (interquartile range), analysed with Mann-Whitney <i>U</i> test.			
^b Number of participants, analysed with chi-square test.			
ASD, autism spectrum disorder; BMI, body mass index.			

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Table 3. Comparison of care burden, pain, fatigue, sleep quality, anxiety, depression, and health-related quality of life between the mothers of children with ASD and those with typically developing children

	Mothers of children with ASD (n=35)	Mothers of typically developing children (n=35)	<i>p</i>	U/χ^2	<i>d</i>
ZBI ^a	25 (18-31)	12 (6-22)	<0.001*	292.5	1.0
MPQ ^a	44 (27-65)	38 (30-50)	0.250	514.5	0.29
FSS ^a	40 (23-50)	30 (14-44)	0.113	477.5	0.39
Presence of problematic fatigue ^b	19 (54.3)	14 (40.0)	0.231	1.433	0.29
HADS-Anxiety ^a	7 (5-8)	5 (3-7)	0.014*	403.5	0.61
Presence of anxiety ^b	5 (14.3)	3 (8.6)	0.452	0.565	0.18
HADS-Depression ^a	6 (4-8)	6 (4-8)	0.763	587.0	0.07
Presence of depression ^b	15 (42.9)	13 (37.1)	0.626	0.238	0.11
PSQI ^a	13 (11-14)	12 (10-13)	0.019*	414.0	0.58
NHP					
Pain ^a	18.7 (9-33.8)	17.1 (0-36)	0.582	566.0	0.13
Energy ^a	37 (0-61)	0 (0-39.2)	0.049*	454.0	0.46
Sleep ^a	12.6 (0-27.3)	0 (0-12.6)	0.071	476.5	0.39
Mobility ^a	0 (0-21.4)	0 (0-22)	0.877	600.5	0.04
Emotional reaction ^a	16.8 (10.5-24.4)	0 (0-14)	<0.001*	315.0	0.92
Social isolation ^a	0 (0-22)	0 (0-0)	0.011*	439.0	0.50

* $p < 0.05$

^aMedian (interquartile range), analysed with Mann-Whitney *U* test.

^bNumber of participants, analysed with chi-square test.

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ASD, autism spectrum disorder; ZBI, Zarit Burden Interview; MPQ, McGill Pain Questionnaire; FSS, Fatigue Severity Scale; HADS, Hospital Anxiety and Depression Scale; PSQI, Pittsburgh Sleep Quality Index; NHP, Nottingham Health Profile.

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Table 4. Comparison of the presence of musculoskeletal pain sites during the last year and last week between the mothers of children with ASD and those with typically developing children														
	Musculoskeletal pain sites during the last year							Musculoskeletal pain sites during the last week						
	Mothers of children with ASD (n=35)		Mothers of typically developing children (n=35)					Mothers of children with ASD (n=35)		Mothers of typically developing children (n=35)				
Anatomical region	n	%	n	%	p	χ^2	d	n	%	n	%	p	χ^2	d
Neck	18	51.4	22	62.9	0.334	0.933	0.23	13	37.1	12	34.3	0.803	0.062	0.06
Shoulders	16	45.7	17	48.6	0.811	0.057	0.06	6	17.1	11	31.4	0.163	1.942	0.34
Elbows	4	11.4	2	5.7	0.393	0.729	0.21	3	8.6	1	2.9	0.303	1.061	0.25
Wrists/hands	11	31.4	6	17.1	0.163	1.942	0.34	5	14.3	4	11.4	0.721	0.128	0.09
Upper back	22	62.9	23	65.7	0.803	0.062	0.06	14	40	18	51.4	0.337	0.921	0.23
Low back	16	45.7	19	54.3	0.473	0.541	0.18	10	28.6	9	25.7	0.788	0.072	0.06
Hips/tights	7	20	4	11.4	0.324	0.971	0.24	1	2.9	2	5.7	0.555	0.348	0.14
Knees	9	25.7	10	28.6	0.788	0.072	0.06	1	2.9	5	14.3	0.088	2.917	0.42

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Ankles/feet	10	28.6	9	25.7	0.788	0.072	0.06	7	20	7	20	>0.999	<0.001	<0.001
ASD, autism spectrum disorder.														

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