



## Health status of people with autism spectrum disorder

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### Abstract

#### Purpose

The aim of this study is to determine what changes occur in the health status of people with ASD compared to neurotypical controls.

#### Design/methodology/approach

We performed a comparative analysis of data collected from 72 subjects with ASD and 75 neurotypical controls aged 3-24 years using the Rochester Health Status Survey IV (RHSS-IV). A structured individual interview was conducted to compare the health status of subjects in Macedonia.

#### Findings

The majority of people with ASD take vitamins, supplements and use recommended drug therapies compared to the neurotypical population and experience a larger number of side effects ( $p=0.000$ ). Compared to people with neurotypical development, children with ASD have a higher prevalence of oral ulcers (31.9% vs. 17.3%;  $p=0.039$ ), changes in neurological health status- epilepsy (19.4% vs. 2.7%;  $p=0.001$ ) and ADD/ADHD (only persons with ASD-19.4%;  $p=0.000$ ); respiratory diseases- angina (30.5% vs. 8%;  $p=0.000$ ), rhinitis and / or sinusitis (40.3% vs. 17.3%;  $p=0.02$ ); changes in the gastrointestinal system- constipation (31.9% vs. 10.6%;  $p=0.02$ ), intestinal inflammation (19.4% vs. 8%;  $p=0.043$ ), permeable intestines (only persons with ASD - 13.9%;  $p=0.000$ ) and the presence of the fungus *Candida albicans* (19.4% vs. 4%;  $p=0.043$ ); psychiatric disorders- sleep problems (only in people with ASD - 18%;  $p=0.000$ ) and tics (6.9% vs. 2.6%;  $p=0.25$ ), and skin diseases- eczema/allergic skin rash (36.1% vs. 18.7%;  $p=0.02$ ).

#### Originality

Many children with ASD have health problems. These findings support and complement the professional literature on their mutual causality.

*Keywords:* autistic spectrum disorder, health status, disease.

## Introduction

Autism Spectrum Disorder (ASD) is a group of complex and heterogeneous developmental conditions characterised by decreased social interaction and communication, as well as a limited range of interests and / or stereotyped behaviour. ASD, like other developmental disabilities, does not exclude health, which is a state of complete physical, mental and social well-being, and not just the absence of disease or physical disability (APA, 2013).

It is estimated that around one in 160 people of school age worldwide have ASD (Elsabbagh et al., 2012). Another study estimated a global prevalence of 7.6 cases of ASD per 1000 (1 in 132) in an epidemiological review (Baxter et al., 2015). There is strong evidence linking most neurodegenerative disorders as well as ASD to male predominance in a 4-5:1 ratio (Christensen et al., 2016).

Their health condition covers the overall biological and psychological status of the person, which becomes an important measure for the outcome of people with ASD. In addition to genetics, our health is a direct consequence of exogenous factors such as diet, exercise, alcohol consumption, smoking, exposure to toxins, etc. They affect our health and that reflects on our health. ASD is associated with an increased prevalence of several medical conditions and potential causal factors are identified in most individuals (Tye et al., 2019).

People with ASD have a number of changes in their health. They show a higher prevalence for certain medical diseases / conditions than the neurotypical population (Trajkovski, 2019).

Many of the underlying cognitive and behavioural symptoms associated with ASD are thought to arise from CNS dysfunction (Bourgeron, 2015). However, the accumulated and convergent evidence in several areas of medicine strongly emphasises comorbid medical conditions and associated peripheral / central physiological abnormalities in children with ASD as potential indications for additional etiological factors. Epidemiological evidence shows that medical disorders are much more common in people with ASD compared to neurotypical individuals (Kohane et al., 2012).

A detailed assessment made by the Centers for Disease Control in the United States shows that children with ASD are much more likely to have: epilepsy, gastrointestinal problems, eczema, allergies, asthma, ear and respiratory infections, schizophrenia, CNS / cranial abnormalities, type I

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3 diabetes , muscular dystrophy, sleep disorders, severe headaches, migraines, etc. (Kohane et al.,  
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5 2012).

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7 A wide range of gastrointestinal abnormalities are present, such as diarrhoea, constipation,  
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9 vomiting, feeding problems, gastroesophageal reflux, and abdominal pain (Navarro, Liu & Rhoads,  
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11 2016).

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13 In the study where more than 1.5 million people aged 0-24 with intellectual disability and  
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15 autism participated, they independently predict poor health, intellectual disability more for general  
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17 health, and autism more for mental health (Kinnear et al., 2019).

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19 Other studies show a higher prevalence of minor neurological abnormalities in people with  
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21 ASD compared to neurotypical controls (96.9% vs. 15.6%) (Gabriele et al., 2018) and genetic  
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23 predisposition is considered a risk factor (Xiong et al., 2019).

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25 In the research of Trajkovski, the most common medical conditions were acute infectious  
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27 diseases - measles, neonatal jaundice and angina, followed by convulsions and some allergies to  
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29 food, drugs and inhalants. Infections of the lower respiratory tract, such as bronchitis and  
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31 bronchopneumonia and gastrointestinal disorders, were less common (Trajkovski, 2013).

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33 In a study by Fortuna et al. (2016) adults with ASD have a higher rate of epileptic seizures,  
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35 depression, hypertension, and allergies than the general population. They also have higher rates of  
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37 anxiety, psychosis and ADHD. In contrast, there are significantly lower rates of migraines, sexually  
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39 transmitted diseases, tobacco use, and alcohol abuse in adults with ASD compared to the general  
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41 population.

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43 It is of great importance to timely diagnose and recognise changes in the health of people  
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45 with ASD and to monitor the health condition, which could reduce negative moods.

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47 Reviewing changes in health status can be useful for early detection and assessment of ASD  
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49 and in selecting the most appropriate interventions and services for children with ASD (Soke et al.,  
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51 2018).

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53 It is important to determine whether professionals, parents, special educators and  
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55 rehabilitators can correctly and timely identify and recognise these changes that occur in people with  
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57 ASD.  
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## Methods

This study includes a total of 147 respondents living in Macedonia, of which 72 respondents were diagnosed with ASD and 75 neurotypical controls. The age range of the respondents is 3-24 years. The research was conducted in the period from January to July 2019 in most areas of Macedonia (Skopje, Bitola, Prilep, Veles, Tetovo, Ohrid, Struga, Stip, Kicevo, Kavadarci and the village of Krivogashtani). We collected health information from both groups using the Rochester IV Health Status Determination Form (RHSS-IV) by conducting a structured individual interview with the parent, caregiver, special educator, rehabilitator, in person with the respondent or by analysing documentation. **The Rochester IV Health Status Form is a questionnaire used to identify the incidence and prevalence of certain diseases over a lifetime, as well as functional abilities, use and frequency of some health services, and the same instrument is validated and used in multiple papers (Davidson et al., 2008 & Fortuna et al., 2016)**

The contacts were provided through the Macedonian Scientific Association for Autism, through direct contact with the institutions for access to the target groups and through indirect telephone conversations with the respondent, ie parent, guardian or special educator or rehabilitator. The institutions where the research was conducted are the following: POU "Idnina" and "Zlatan Sremac" in Skopje, Daily Center for Autism in Skopje, NGO "Open the Windows" in Skopje, Center for Psychophysical Health, "Gaspar" in Skopje, Institute for Rehabilitation of Children with Impaired Hearing and Speech and Other Developmental Problems "Kocho Racin" in Bitola, PHI "Institute for Rehabilitation of Hearing, Speech and Voice" in Bitola, JOU Detska kindergarten "Our Future" in Prilep and in several primary schools within Bitola and Prilep. In other cities the data was collected by telephone. The respondents have received a diagnosis in the appropriate centers and institutions within the territory of Macedonia.

We examined specific health conditions in multiple systems of the human body, including lung disease, gastrointestinal disease, neurological disease, psychiatric disease, dental disease, and skin disease, as well as the use of medications / supplements. The existence of a specific health condition was assessed based on questions about the individual health conditions in each system. We analysed health conditions based on the prevalence of the condition from birth or if the condition or disease occurred in the last 24 months.

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3 The data from this research were graphically processed and tabulated using SSPS statistical  
4 software. Statistical analysis is made through differences in health status. For comparison between  
5 the two groups, the Chi square-independence test was used. Significance was determined at the level  
6 of  $p < 0.05$ . Correlation analysis was performed to see the correlation between the results obtained  
7 from the instruments.  
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## 14 **Results**

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16 A total of 147 respondents were analysed. Table I shows their demographic characteristics.  
17 The sample had more males (79%) than female respondents (21%), which is consistent with male  
18 dominance in ASD ( $p = 0.00$ ). There was no significant difference in gender between the two  
19 examined groups ( $p = 0.09$ ) and any difference in health status would not be related to gender. There  
20 was no significant difference in terms of age between the two groups of respondents ( $p = 0.801$ ),  
21 which would also not affect changes in health. The mean age of the sample in subjects with ASD is  
22 10.53 years, whilst in subjects from the control group it is 10.37 years. Also, there is no significant  
23 difference in terms of height ( $p = 0.711$ ) and weight ( $p = 0.209$ ) between the two groups of  
24 respondents.  
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33 [please insert Table I]  
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36 Table II shows the use of medications / supplements, the type of medication and their side  
37 effects. ASD subjects used more medication and / or supplements than the neurotypical controls ( $p =$   
38  $0.000$ ). A large part, i.e. 94% of respondents with ASD took vitamins in contrast to the neurotypical  
39 controls (37.7%). A much larger proportion of respondents (81.9%) with ASD consumed supplements  
40 and 48.6% took medication as opposed to people with neurotypical development (9.3% used  
41 medications and 8% supplements).  
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47 The types of drugs that were most often prescribed for the two examined groups are  
48 antibiotics and their use does not depend on the group ( $p = 0.620$ ). Respiratory drugs are more  
49 commonly prescribed for people with ASD compared to neurotypical controls (33.3% vs. 12%;  $p =$   
50  $0.002$ ). Drugs prescribed for neurological conditions including epilepsy were used more frequently by  
51 people with ASD (20.8%) compared with neurotypical controls (5.3%) that were interdependent with  
52 ASD ( $p = 0.014$ ), as well as drugs for skin diseases ( $p = 0.007$ ). Significantly more people with ASD  
53 (27.8%) compared to the neurotypical controls had side effects from the use of drugs ( $p = 0.000$ ).  
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3 [please insert Table II]  
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5 Health status is an important and inevitable factor for the biological and psychological status  
6 of a person with ASD. They have been noted to have altered physiological functioning of the systems  
7 of the human body which will be tabulated below.  
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11 Table III presents data on diseases or conditions of the teeth or gums. People with ASD are  
12 less prone to dental caries ( $p = 0.026$ ) but more susceptible to oral ulceration ( $p = 0.039$ ), whilst for  
13 other oral health problems, oral abscess or infection and toothache or oral pain, there is no difference  
14 between the groups. That is, the condition occurs regardless of whether the person has ASD ( $p > 0.2$ ).  
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17 [please insert Table III]  
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21 Table IV presents the neurological diseases / conditions. Two neurological conditions were  
22 observed in people with ASD, namely: epilepsy ( $p = 0.001$ ) and ADD / ADHD ( $p = 0.000$ ) with 19.4%  
23 of them. Epilepsy was seen in only 2.7% of neurotypical controls, and no ADD / ADHD was reported.  
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26 [please insert Table IV]  
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29 Some diseases of the respiratory system (Table 5) occurred more frequently in people with  
30 ASD compared to neurotypical controls, these include: angina (30.5% vs. 8%;  $p = 0.000$ ) and rhinitis  
31 and / or sinusitis (40.3% vs. 17.3%;  $p = 0.02$ ), whilst pneumonia / bronchitis occurs independently of  
32 the group (19.4 vs. 13.3%;  $p = 0.39\%$ ).  
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35 [please insert Table V]  
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39 Table VI shows gastrointestinal diseases / conditions. A large proportion of people with ASD  
40 compared to people with neurotypical development have the following gastrointestinal diseases /  
41 conditions: constipation (31.9% vs. 10.6%;  $p = 0.02$ ), intestinal inflammation (19.4% vs. 8% ;  $p =$   
42 0.043) and presence of the fungus *Candida albicans* (19.4% vs. 4%;  $p = 0.043$ ). While gastrointestinal  
43 reflux occurs independently of the group ( $p = 0.538$ ).  
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46 [please insert Table VI]  
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50 Psychiatric disorders are shown in Table VII. Sleep problems have been reported in 18% of  
51 people with ASD and are not present in neurotypical controls ( $p = 0.000$ ). Only a small proportion of  
52 people with ASD compared to neurotypical controls reported tics (6.9% vs. 2.6%;  $p = 0.25$ ). The low  
53 frequency of psychiatric illnesses is due to the age of the respondents, they are more common in  
54 adults with ASD (Joshi et al., 2013).  
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57 [please insert Table VII]  
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4 Although less likely, people with ASD may also have a higher incidence of skin diseases or  
5 conditions. Table VIII lists the dermatological health status. Compared to the neurotypical population,  
6 people with ASD have a higher incidence of eczema or allergic skin rash (36.1% vs. 18.7%;  $p = 0.02$ ),  
7 while dry skin occurs equally in both groups ( $p = 0.6$ ).  
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11 [please insert Table VIII]  
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## 15 Discussion

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17 This study showed that people with ASD take more vitamins, supplements and prescribed  
18 drug therapy and have a greater predominance of oral ulcers, changes in neurological health -  
19 epilepsy and ADD / ADHD; respiratory diseases - \*angina, rhinitis and / or sinusitis; changes in the  
20 gastrointestinal system - constipation, intestinal inflammation, permeable intestines and the presence  
21 of the fungus *Candida albicans*; psychiatric disorders - sleep problems and tics, and skin diseases -  
22 eczema or allergic skin rash. There are more changes in the health status of people with ASD  
23 compared to people with neurotypical development. Our results are in line with the scientific literature,  
24 complement it and provide a more comprehensive understanding of health. There is an increased use  
25 of vitamins (94%), supplements (81.9%) and any type of recommended drug therapy (37.3%) in  
26 people with ASD ( $p = 0.000$ ) compared to children with neurotypical development who take less  
27 vitamins (37.3%), supplements (8%) and medicines (9.3%). Children with ASD are no more likely to  
28 be prescribed antibiotics compared to neurotypical controls ( $p = 0.620$ ), which was confirmed in an  
29 extensive meta-analysis in 2019 (Łukasik J et al., 2019). Whereas, people with ASD who frequently  
30 take antibiotics, are at increased risk of antibiotic-associated  
31 weight gain and asthma (Korpela et al., 2016). Children with ASD are more likely to receive  
32 medication for respiratory diseases ( $p = 0.002$ ). No evidence of this has been found in children, but  
33 older people with asthma and chronic obstructive pulmonary disease who have an intellectual  
34 disability and / or ASD are more likely to be prescribed adrenergic drugs for systemic use than the  
35 neurotypical population (Axmon, Höglund & Ahlström, 2017). Part of the population with ASD use  
36 drug therapy in order to alleviate symptoms caused by health conditions, but they in turn have  
37 contraindications that are reflected individually in each of them ( $p = 0.000$ ) and thus are more likely to  
38 experience side effects from medication therapy compared to neurotypical controls (Shedlock, 2016).  
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3 People with ASD may have oral health problems. The very pathophysiological mechanism  
4 involved in ASD, frequent use of drugs and harmful habits can cause oral problems, caries, and  
5 periodontal disease in children with ASD compared to the general population. In our study, children  
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7 with a ASD were less susceptible to dental caries,  $p = 0.026$ , but more susceptible to oral ulceration,  
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9  $p = 0.039$ .

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12 In a study by Kalyoncu & Tanboga (2017), ASD was not associated with the prevalence or  
13 severity of increased dental caries. In addition, good parental supervision for brushing is an extremely  
14 important factor in children with ASD who have less caries while poor oral hygiene and periodontal  
15 problems may be related to improper brushing habits as a result of the difficulties faced by trainers  
16 and parents when brushing their teeth. While the study of Vajawat & Deepika (2012), suggests that  
17 patients with autism have a higher rate of periodontal disease and lower caries compared to controls,  
18 another study found that gingival health in children with ASD was good (AlOtaibi et al., 2021).

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21 There is a coexistence of ASD with neurological diseases / conditions in literature. Numerous  
22 studies have linked ASD to epilepsy. In our study 19.4% of people with ASD have epilepsy. In other  
23 studies, epilepsy in people with ASD ranged between 2% and 46% (El Achkar & Spence, 2015;  
24 Spence & Schneider, 2009). There is a greater prevalence of abnormal neurological findings and  
25 clinical neuropathology in children with ASD (Tripi et al., 2018; Trajkovski, 2019; Xiong et al., 2019).

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28 Concomitant ADHD is common in children with ASD (Rau, 2020). Children with ASD and  
29 ADHD have an increased risk of anxiety and mood disorders (Gordon-Lipkin et al., 2018; Fortuna et  
30 al., 2016). 19.4% of the respondents in our study have ADD / ADHD. Mahajan et al. (2012) showed  
31 ADHD comorbidity in 41-78% of children with ASD, in contrast to our study, which had a lower  
32 incidence. There are studies where the prevalence is lower, but it depends on the size and age of  
33 participants. As DSM-IV-TR and ICD-10 prevent the dual diagnosis of ADHD and ASD, this could  
34 account for the age differences in comorbidity and differences in studies depending upon when the  
35 child was diagnosed and whether the study took this into account.

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38 In terms of respiratory diseases, angina is significantly more common in children with ASD in  
39 our study (30.5% vs. 8%;  $p=0,000$ ). Angina is present in 33% of participants and is confirmed in the  
40 study of Kohane et al. (2012). In our study, a large proportion of people with ASD have sinusitis or  
41 middle ear infections (40.3% vs. 17.3% of the neurotypical population). Adams et al. (2016) performed  
42 a retrospective case study comparing acute otitis media and otitis-related diseases in children with  
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3 ASD compared to the general population. Children with ASD had a significantly increased rate of  
4 acute otitis media, otitis media with effusion, otitis, and PE tube placement. Children with ASD were  
5 more than twice as likely to develop mastoiditis. It is important to distinguish between otitis media and  
6 mastoiditis because of the treatment. If a child with acute mastoiditis does not respond to treatment or  
7 if complications develop, further examinations and other surgical procedures are considered,  
8 including mastoidectomy (Laulajainen-Hongisto, Aarnisalo & Jero, 2016).

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15 The immune system is thought to play a challenging role in ASD. In a study by Harville et al.  
16 (2019), people with ASD have much higher values of HLA-Cw7 compared to the general population.  
17 HLA-Cw7 has a role in stimulating NK cells. Chronic activation of NK cells may play a role in the  
18 manifestation of ASD in a group of individuals with an increased immune response and inflammatory  
19 conditions, including a greater likelihood of having allergies, food intolerance, and chronic sinusitis.

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People with ASD have a higher incidence of changes in the gastrointestinal tract and changes  
in the microbiome. A wide range of gastrointestinal abnormalities are present, such as diarrhoea,  
constipation, vomiting, feeding problems, gastroesophageal reflux, and abdominal pain (Navarro, Liu  
& Rhoads, 2016). Gastrointestinal disorders are common in children with ASD in more than 50% of  
children who have constipation or diarrhoea (Mannion, Leader & Healy, 2013). In our study ASD  
affects the occurrence of intestinal inflammation ( $p = 0.043$ ) and permeable intestines ( $p = 0.000$ ).  
While constipation occurs in 31.9% of people with ASD compared to 10.6% of people with  
neurotypical development ( $p = 0.02$ ). Impaired intestinal epithelial barrier in people with ASD that is  
physiologically involved in controlling the transit of molecules from the gastrointestinal tract can lead  
to altered intestinal permeability (Viggiano, 2015). ASD did not affect the occurrence of  
gastroesophageal reflux ( $p = 0.538$ ), while in the study of Navarro et al. (2016) they are  
interdependent.

Gastrointestinal *Candida albicans* is twice as common in young children with ASD as in  
neurotypical individuals releasing ammonia and other toxins associated with ASD behaviour (Iovene  
et al, 2017; Strati et al, 2017). In our study, the fungus *Candida albicans* is more common in people  
with ASD - 19.4% compared to the control group - 4% ( $p = 0.043$ ).

The link between psychiatric disorders and ASD is no longer seen as interconnected  
diagnoses, but as conditions that can coexist (APA, 2013).

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3 Sleep problems are common in people with ASD. They occur three times more often than in  
4 the neurotypical population (Verhoeff et al., 2018). Research suggests that basic neurophysiology and  
5 neurochemistry may predispose individuals with ASD to chronic sleep disorders. This disrupts the  
6 physiological mechanism of sleep (Charrier et al., 2017; Carmassi et al., 2019). Other theories  
7 suggest that sleep disturbance may be a secondary condition influenced by other additional medical  
8 and psychiatric conditions present with ASD (Mazzone et al., 2018). Sleep problems are significantly  
9 increased in children with epilepsy (Al-Biltagi, 2014). Other studies indicate the presence of tics  
10 (Tourette syndrome) and other comorbidities in people with ASD (Rizzo et al., 2017; Gulisano et al.,  
11 2020).

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21 People with ASD are exposed to a number of dermatological diseases. A large proportion of  
22 people in our study have atopic dermatitis (eczema) with 36.1% and 18.7% of respondents with  
23 neurotypical development ( $p = 0.018$ ).

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A systematic review of 18 studies evaluating the association between ASD and atopic  
dermatitis was performed. Overall results reveal an association between ASD and atopic dermatitis,  
suggesting that subjects with ASD have an increased risk of developing atopic dermatitis compared to  
controls and vice versa. This association is supported by clinical / epidemiological aspects, genetic  
background and common immune and autoimmune processes. However, variability in population and  
study design and the presence of other risk factors that act as confounding factors sometimes  
contribute to inconsistent results (Billeci et al., 2015).

A new meta-analysis in 2020 processed data from 24 potentially relevant publications. This  
study, like Billeci's previous one, demonstrates a significant correlation between atopic dermatitis and  
ASD. Further research is needed on the possibility of a joint pathogenesis between atopic dermatitis  
and ASD (Tsai, 2020).

### Implications

- Early diagnosis to include better health care for children with ASD for further developmental and medical evaluations, diagnostic and therapeutic interventions including early intervention. Children diagnosed with ASD should be identified as children with special health needs.
- Effectively treat medical illnesses or conditions to reduce and better manage morbidity and longevity in people with ASD.

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- Timely and early diagnosis is crucial for the well-being of children with ASD and their families, which is an integral function of health care. Early etiology can predict a number of future treatment plans, from medical to genetic parental counseling.
- Local multi-agency strategies for children with ASD should be established, with managerial, commissar and clinical presentation of health services, education, social protection, parenting of children with ASD and the voluntary sector.

## Conclusion

The study as a whole showed that the change in health status of people with ASD is significantly more common than in children with neurotypical development. People diagnosed with autism spectrum disorder have higher frequencies of one or more comorbidities / conditions such as: oral ulcers, changes in neurological health status - epilepsy and ADD / ADHD; respiratory diseases - angina, rhinitis and / or sinusitis; changes in the gastrointestinal system - constipation, intestinal inflammation, permeable intestines and the presence of the fungus *Candida albicans*; psychiatric disorders - sleep problems and tics, and skin diseases - eczema or allergic skin rash. The presence of concomitant medical conditions in people with ASD highlights the enormous heterogeneity within the disorder. The types of diseases that occur and how they manifest vary from person to person with ASD. These conditions can worsen the characteristics of ASD or affect the timing of the diagnosis of ASD, so it is important to understand how they interact with ASD. Due to the symptomatology of ASD, medical diseases or conditions often remain unrecognised and untreated in a timely manner. They can be chronic and, in many cases, if not recognised and treated, progress. All the medical comorbidities discussed and the subsequent pathological processes can adversely affect the behaviour, socialisation, communication, cognitive function and sensory processing of people with autism.

Accurately identifying and addressing medical concurrence in autism will help reduce the enormous emotional, physical, and financial burden on families and carers. These data highlight the need for clinicians to consider the high prevalence of ASD-related diagnoses and the possibility that in younger children, other symptoms or disorders may mask or obscure the underlying symptoms of ASD, leading to a diagnosis.

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3 The wide range of problems faced by people with ASD shown in previous studies suggests  
4 that an assessment of changes in health status should lead to a comprehensive clinical assessment,  
5 including neurodevelopmental, psychiatric and cognitive assessment and follow-up regardless of the  
6 final clinical diagnose. Many of these medical conditions are treatable, often resulting in an improved  
7 quality of life for the patient and family.  
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12 Children and adults with autism have an increased need for paediatric and psychiatric  
13 specialist services, both for their underlying functional deficits and concomitant medical conditions.  
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15 Appropriate and individualised medical assessment must be performed in all cases, including  
16 documented clinical examination.  
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## 20 21 22 **Acknowledgements**

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27 this manuscript and approve the manuscript and the order of authorship listed on the cover page.  
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## 32 33 34 **Conflict of interests**

35 Authors declare no conflict of interests.  
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**Table I**

Demographic data

	ASD				Control group				p value
	Min	Max	M	$\sigma$	Min	Max	M	$\sigma$	
Age	3	24	10.53	4.07	3	20	10.37	3.68	p=0.801
Height	76	180	142.60	26.06	98	181	144.08	22.23	p=0.711
Weight	15	95	46.26	20.15	14	85	42.47	17.21	p=0.208
Volume of half	23	128	63.46	20.13	24	98	63.60	15.42	p=0.964

**Table II**

Use of medications / supplements and their side effects

	ASD	Neurotypical population	p value
<b>Medications / supplements: f (%)</b>			
Drugs	35 (48.6)	7 (9.3)	0,000
Vitamins	68 (94.4)	28 (37.3)	
Supplements	59 (81.9)	6 (8)	
<b>Types of drugs: f (%)</b>			
Antibiotics	47 (65.3)	43 (57.3)	0.620
Respiratory diseases	24(33.3)	9 (12)	0.002
Epilepsy and / or other nev. Conditions	15(20.8)	4 (5.3)	0.014
Leather	10(13.9)	1 (1.3)	0.007
<b>Side effects of medications: f (%)</b>			
	20(27.8)	2(2.6)	0.000

**Table III**

Oral health status in people with ASD compared to the neurotypical population.

	ASD	Neurotypical population	p value
Oral health:f (%)			
Oral ulcers	23 (31.9)	13 (17.3)	0.039
Dental caries / cavities	19 (26.4)	33 (44)	0.026
Oral abscess / infection	15 (20.8)	10 (13.3)	0.31
Toothache / oral pain	12 (16.7)	14 (18.6)	0.79

**Table IV**

Neurological health status in people with ASD compared to the neurotypical population.

	ASD	Neurotypical population	p value
Neurological diseases: f (%)			
Epilepsy	14 (19.4)	2 (2.7)	0.001
ADD / ADHD	14 (19.4)	0	0.000

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**Table V**

Health status of the respiratory system in people with ASD compared to the neurotypical population.

	ASD	Neurotypical population	p value
Respiratory system: f (%)			
Angina	22 (30.5)	6 (8)	0.000
Pneumonia / bronchitis	14 (19.4)	10 (13.3)	0.39
Rhinitis and / or Sinusitis	29 (40.3)	13 (17.3)	0.02



**Table VI**

Gastrointestinal health status in people with ASD compared to the neurotypical population.

	ASD	Neurotypical population	p value
Gastrointestinal system: f (%)			
Intestinal inflammation	14 (19.4)	6 (8)	0.043
Gastroesophageal reflux	9 (12.5)	7 (9.3)	0.538
Permeable hoses	10 (13.9)	0	0.000
Presence of Candida albicans	14 (19.4)	3 (4)	0.043
Constipation	23 (31.9)	8 (10.6)	0.02

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**Table VII**

Psychiatric health status in people with ASD compared to the neurotypical population.

	ASD	Neurotypical population	p value
Psychiatric disorders: f (%)			
Sleep problems	13 (18)	0	0,000
Tics	5 (6.9)	2 (2.6)	0.25

**Table VIII**

Health dermatological condition in people with ASD compared to the neurotypical population.

	ASD	Neurotypical population	p value
<b>Skin diseases</b>			
Eczema or allergic skin rash	26 (36.1)	14 (18.7)	0.02
Dry skin	11 (15.3)	11 (14.7)	0.6

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