Factors affecting the behavior of children with ASD during the first outbreak of the COVID-19 pandemic

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Abstract
Aim and methods Cross-sectional data from 118 Chilean children with ASD collected during the pandemic outbreak of COVID-19 in 2020 were evaluated to analyze predictors of behavioral problem impairment.

Results Forty-five percent of parents stated that their children’s behavioral difficulties increased in intensity or frequency. The adjusted predictors were having a family member hospitalized with COVID-19 (OR = 4.11; 95% CI = 1.53–11.1) and parents’ mental health disorders during the pandemic (OR = 2.43; 95% CI = 1.01–5.83).

Conclusion Potentially modifiable psychosocial factors affecting children’s behavior should be considered in a possible second outbreak.

Keywords Autism spectrum disorder · Behavior disorder · COVID-19 · Risk factors

Introduction
Autistic traits usually begin in the first years of life but may not become entirely evident until social demands exceed individual communicative abilities. Hence, to avoid anxiety and behavioral alterations, individuals with ASD have a preference for stable surroundings and structured routines. In this sense, unexpected environmental challenges may likely lead to alterations in familiar relationships, daily functioning, and biological cycles [1].

Unquestionably, a worldwide sanitary crisis such as the current pandemic brings about significant changes to the community’s regular activities. During the first pandemic outbreak, Chile was one of the Latin American countries with the largest number of confirmed cases of COVID-19 [2]. As a result, health authorities have instructed extended mandatory quarantine periods, limiting personal mobility and impeding access to social spaces, including schools, non-emergency developmental and rehabilitation centers, and other public places. Besides, families were forced to adapt their lives in accordance with these restrictions, including home-based working and schooling.

As mentioned above, change in routine is often a major challenge for children with ASD; therefore, they are vulnerable to developing behavioral disorders during the quarantine [3]. This study aims to assess the impact of the first pandemic outbreak of COVID-19 on the intensity and frequency of behavioral problems (BP) of Chilean children with ASD.

Methodology
In this cross-sectional study, 152 parents of children and adolescents with ASD followed at UC-CHRISTUS Health Network, Santiago, Chile, were invited to answer an online
survey during the pandemic through Google Forms. The questionnaire was available online from August 1 to October 30, 2020. All evaluated patients (aged 2 to 15 years) had ASD diagnosis, according to DSM 5 criteria [4], with an Autism Diagnostic Observation Schedule, second edition (ADOS-2) scoring above the diagnostic cutoff [5]. Children and adolescents with developmental abnormalities due to a demonstrated chromosome disorder or monogenic mutation were excluded. The institutional ethics committee approved the study (CEC-MedUC: 200617027), and each child or adolescent caregivers gave informed consent. An informative first paragraph explained the aim of the study and informed caregivers of ethical approval. Collected data remained anonymized and securely protected during research.

A national multidisciplinary expert panel evaluated an adapted survey applying the modified DELPHI method [6, 7]. After two rounds of online consultation to enhance the decision-making process and clarify the language used to describe each item, the consensus among experts was over 80% for relevance and wording quality agreement. The survey instrument was formulated to rate behavioral impact on children with ASD during the first pandemic outbreak of COVID-19, applying yes or no questions or multiple-choice questions using a 3-point Likert scale based on intensity and frequency of BP (more, equal, and less than before the pandemic).

All statistical analyses were performed using the IBM SPSS Statistics version 23 (Armonk, NY: IBM Corp.)

| Table 1 | Univariate predictors for increased intensity and frequency of children’s behavioral difficulties during the pandemic outbreak (n = 118) |
|---------|-----------------------------------------------------------------------------------------------------------------------------------|
| **Studied variables** | **IBD (n)** with variable (n) vs. IBD (n)/without variable (n) | **OR (95% CI)** | **p value** |
| **Demographics** | | | |
| Male gender | 46/95 vs. 7/23 | 2.15 (0.81–5.69) | 0.125 |
| Age (years) | Continuous variable | 0.98 (0.87–1.10) | 0.673 |
| Age < 6 years | 26/52 vs. 27/66 | 1.44 (0.69–3.00) | 0.325 |
| Living in the capital city | 39/83 vs. 14/35 | 1.33 (0.60–2.97) | 0.486 |
| Residence with backyard or garden | 51/109 vs. 2/9 | 3.10 (0.61–15.5) | 0.173 |
| Living with both parents | 38/90 vs. 15/28 | 0.63 (0.27–1.49) | 0.294 |
| Living with a single parent | 15/25 vs. 38/93 | 2.17 (0.88–5.34) | 0.092 |
| Living with extended family | 19/36 vs. 34/82 | 1.58 (0.72–3.47) | 0.257 |
| Living with other children | 25/64 vs. 28/54 | 0.60 (0.29–1.24) | 0.165 |
| Living with an individual with ASD | 13/25 vs. 40/93 | 1.44 (0.59–3.48) | 0.424 |
| Therapy before the pandemic | 49/110 vs. 4/4 | 0.80 (0.19–3.38) | 0.765 |
| Daycare or school before the pandemic | 52/113 vs. 1/5 | 3.41 (0.37–31.5) | 0.279 |
| Therapy during the pandemic | 27/67 vs. 26/51 | 0.65 (0.31–1.35) | 0.249 |
| Daycare or school during the pandemic | 46/94 vs. 7/24 | 2.33 (0.88–6.13) | 0.087 |
| Death of someone close to the child | 12/22 vs. 41/96 | 1.61 (0.63–4.09) | 0.317 |
| Parent mental health problems | 18/30 vs. 35/88 | 2.27 (0.98–5.29) | 0.057* |
| Pandemic-related unemployment of parents | 9/15 vs. 44/103 | 2.01 (0.67–6.07) | 0.215 |
| Home-based telework of parents | 29/74 vs. 24/44 | 0.54 (0.25–1.14) | 0.107 |
| **Clinical characteristics** | | | |
| Absence of verbal language | 5/13 vs. 48/105 | 0.74 (0.23–2.42) | 0.621 |
| Effortless fluent speech | 27/61 vs. 26/57 | 0.95 (0.46–1.96) | 0.883 |
| Behavioral problems before the pandemic | 38/72 vs. 15/46 | 2.31 (1.07–4.99) | 0.033 |
| Other medical condition | 8/26 vs. 45/92 | 0.46 (0.18–1.17) | 0.105 |
| **COVID-19 related features** | | | |
| Household member with COVID-19 | 2/9 vs. 51/109 | 0.33 (0.07–1.64) | 0.173 |
| Family member with COVID-19 | 26/52 vs. 27/66 | 1.44 (0.69–3.00) | 0.325 |
| Family member hospitalized with COVID-19 | 17/24 vs. 36/94 | 3.91 (1.48–10.4) | 0.006* |
| Family member deceased by COVID-19 | 6/10 vs. 47/108 | 1.95 (0.52–7.30) | 0.323 |

*IBD* increased intensity and frequency of children’s behavioral difficulties. *OR for age is per 1-year increase in age. *Statistically significant in multivariable analysis
software. Continuous data were reported as median and interquartile ranges (IQRs), while categorical data were reported as absolute and relative frequencies. We used Fisher’s exact test for associations between dichotomous variables. A forward, stepwise multiple logistic regression model was performed to investigate clinical and socio-demographic predictors for higher frequency and intensity of BP, including all variables with a \( p \) value < 0.1 in the univariate analysis (significance set at 5%; results presented as odds ratios (OR) with 95% confidence intervals (CI)).

### Results

Among 152 total participants who met the inclusion criteria, 118 (77%) participated in the survey. In 76.3% of the cases, the mother answered the questionnaire; in 7%, it was the father who answered. In 21%, both parents answered the survey together. Of 118 children with ASD, 94 (79.7%) were boys, and 24 (20.3%) were girls. The median age at survey realization was 6 years (IQR, 4–8), and the median age at ASD diagnosis was 3 years (IQR, 2–5). Baseline characteristics of studied children are summarized in Table 1.

Among the parents who responded, 44.9% stated that the BP of their children increased in intensity or frequency during the pandemic (Table 1). Following a forward, stepwise logistic regression analysis, the predictors of increased intensity and frequency of BP during the pandemic were having a family member hospitalized with COVID-19 (OR = 4.11; 95% CI = 1.01–15.83) and parents’ mental health disorders during the pandemic (OR = 2.43; 95% CI = 1.01–5.83).

### Discussion

Our findings confirm that children and adolescents with ASD recognize the pandemic changes as a cause of worsening BP in their children [6].

As a previous report from which we adapted our survey, children with behavioral difficulties before the pandemic have a considerably increased intensity and frequency of BP than those without this antecedent (44.4% vs. 32.6%) [6]. The pre-existence of mental health disorders among parents predicts children’s behavior worsening during the quarantine, in line with a study showing that parents’ mental health difficulties predicted concurrent children mental health problems in the short-term [9].

Finally, COVID-19’s direct impact is reflected in the behavioral changes observed in children who have a family member hospitalized for the disease, presumably due to stress on the family system as a whole.

Understanding features associated with increased BP in children with ASD during the first outbreak may help prevent child and family psychosocial health impairment during a further prolonged quarantine period. In this sense, the current study results show that both children and family environmental factors affect the frequency and intensity of BP.

### Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1007/s10072-021-05147-9.

### Declarations

**Ethical approval** The institutional ethics committee approved the study (CEC-MedUC: 200617027).

**Conflict interest** The authors declare that there is no conflict of interest.

**Supplementary Information** The online version contains supplementary material available at https://doi.org/10.1007/s10072-021-05147-9.

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