Child Disability and Caregiving in Low and Middle Income Countries: Big Data Approach on open data

Andrea Bizzego¹ Mengyu Lim² Greta Schiavon¹
Peipei Setoh² Giulio Gabrieli² Dagmara Dimitriou³
Gianluca Esposito^{1,2,4,*}

¹Department of Psychology and Cognitive Science, University of Trento, Italy

²School of Social Sciences, Nanyang Technological University, Singapore

³UCL Institute of Education, University College London, London, United Kingdom

⁴Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

*gianluca.esposito@ntu.edu.sg; gianluca.esposito@unitn.it

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Abstract

Background: The presence of child disabilities might affect the amount of caregiving attention the child receives, with potential ramifications on the development of the child and increasing the likelihood of developing a more severe condition. Little is known about the association between child disabilities and caregiving practices in less developed countries, penalized by both lack of data and a research bias toward western societies.

Method: In this study, we apply data mining methods on a large ($N = 29,525$) dataset from UNICEF to investigate the association between caregiving practices and developmental disabilities of the children, and highlight the differences between intellectual and other disabilities.

Results: Our results highlight that, compared to other types of disabilities, intellectual disabilities increased the risk of being neglected by the caregiver in those activities oriented to the cognitive development. The education of the caregiver and the socioeconomical development of the country are actively involved in the moderation of the risk.

Conclusion: We demonstrated that educational policies of parental training, such as psychoeducation regarding intellectual disabilities and destigmatization campaigns, are needed to benefit parental practices in low- and middle-income countries.

developmental disabilities; parental involvement; low middle income countries; caregiving; child discipline; child education

What this paper adds: The paper makes use of a data-driven approach to uncover patterns of caregiving practices in an often overlooked population of children with disabilities in low- and middle-income countries. Using current theories of caregiving, child care and child neglect, the paper integrates these findings with already established frameworks of parental caregiving.

1 Introduction

Parenting, although a commonly shared experience among most childbearing adults in different countries around the world, might be a stressful and demanding process for some parents (Brooks, 1981) as it requires time, effort and material resources such as childcare equipment, toys and child-friendly furniture, and paying for the child’s daily living expenses, education and healthcare. These requirements have been broadly encapsulated as parental nurturance, or caregiving. Parental caregiving quality has important implications for child outcomes. For example, it was found that higher quality parental caregiving is correlated with more secure attachment (Rosen and Rothbaum, 1993) and decreased externalising behaviour (Rothbaum and Weisz, 1994) among young children, thereby contributing to the child’s ability to regulate emotions. As proposed by (Bornstein and Putnick, 2012) and (Eisenberg et al., 2006), parental caregiving can be considered from two domains: cognitive and socioemotional. Cognitive caregiving refers to the methods parents use to guide their child’s learning of the physical world, while socioemotional caregiving consists of the formation and development of interpersonal connection between the child and significant other human individuals. The two domains have significant influence over the child’s ability to communicate, and to develop skills in socioemotional and mental processes (Bornstein, 1985; De Wolff and Van Ijzendoorn, 1997). Examples of cognitive caregiving practices include providing education to the child (Papousek and Bornstein, 1992), joint book reading (DeTemple et al., 2003) and storytelling (Egan, 2001), as well as child-directed speech (Thiessen et al., 2005). These specific examples of cognitive caregiving contribute to overall child development by accelerating the development of cognitive functioning (Behrman et al., 2004) and language ability (Bornstein et al., 1992). On the other hand, socioemotional caregiving may include practices such as interpersonal play (Tamis-LeMonda et al., 2002) and joint activities (Standley and Whipple, 2003). These practices have implications on the child’s future ability to form social relationships with others beyond the immediate familial circles (Emde and Feinman, 1992).

The complexity of factors influencing parenting behaviour was explored in (Belsky, 1984)’s process model of parenting, where it was posited that determinants of parenting behaviour can be narrowed down into parental psychological resources, child characteristics and contextual sources of stress and support that mutually influence each other. In the present work, parental

caregiving behaviour in terms of cognitive and socioemotional caregiving outlined above may be influenced due to the presence of several factors, such as the presence of intellectual or other disabilities in the child. This would fall under the category of child characteristics in the expanded version of (Belsky, 1984)’s model proposed by (Taraban and Shaw, 2018). Child developmental disabilities are conditions that arise from delays or impairments in the child’s physical, learning, language or behavioral development (for Disease Control and Prevention, 2019). Significantly, these conditions affect 52.9 million children aged 5 and below in 195 different countries globally (Olusanya et al., 2018). Child disabilities can be classified into different categories depending on the nature and symptoms of the condition, such as physical disability (for example, spina bifida), sensory impairment (for example, blindness or deafness), and intellectual disability. In particular, intellectual disability (ID) is defined by the American Association on Intellectual and Developmental Disabilities as “limitations in both intellectual functioning and adaptive behaviour” which results in decreased overall intelligence (Schalock et al., 2010), with consequences in daily functioning and adaptive behavior (Tassé and Grover, 2013). Regardless of type of disability, parents of children with a disability generally experience greater parenting stress (Tomanik et al., 2004; Hassall et al., 2005) and poorer mental health (Oelofsen and Richardson, 2006), along with a host of other negative outcomes (Pelchat et al., 2003). The increased psychological stress experienced by these parents in turn contribute to lower quality caregiving and poorer child outcomes, such as poorer social competence (Anthony et al., 2005). (Hastings, 2002), using a family processes model, found that the increased parental stress, parental caregiving and the child’s behavioural problems due to disability interact with each other, potentially contributing to a vicious cycle where both parental and child negative outcomes are exacerbated. For a vulnerable population as that of children suffering from ID or other disabilities (OD) (Engle et al., 2007), this knowledge is particularly significant for health professionals and family members as it can directly influence the child’s prognosis.

When examining child disability in terms of specific diagnoses, differential diagnoses have varying impact on the child’s lived experience and the behaviour and care provided by their surrounding sources of support. For example, (Eddy and Engel, 2008) reports a moderate effect of diagnosis type on five aspects of family outcomes, including the intensity of worry about the child and the degree of limitation and interruption of family activity. (Wei

and Jennifer, 2012) similarly found that the type of disability affected family interaction differently, with conditions that caused emotional disturbances within the child to more strongly affect the frequency of negative family experiences. The above interaction between parental stress, caregiving and child behaviour was also seen in cases of child Autism Spectrum Disorder (Osborne and Reed, 2009), a condition that is co-morbid with up to 30% of child ID cases (Baio, 2014). Additionally, different from other common child disabilities, ID is typically construed as a condition that is inherently internal (Rapley, 2004) rather than external (as in the case of physical disabilities), and is similarly more stigmatized (Ruddick and Oliver, 2005) and poorly understood (Scior, 2011). For these reasons, the present paper will focus on the comparison between ID and OD within the context of parental caregiving.

From a meta-analysis conducted by (Maulik et al., 2011), the prevalence of ID is almost twice as high in low- and middle-income countries (LMIC) as compared to high-income countries, and is part of the larger trend of greater prevalence of child disability in general in LMIC (Department of Health and Social Care, 2001). Despite the unequal rates of prevalence of ID distributed globally, much of the research surrounding ID is conducted within cultural contexts that are more aligned with high-income countries (Henrich et al., 2010), resulting in disproportionate representation from LMIC in ID research. As a result, growing scientific focus is placed on conducting objective cross-cultural research in the field of child development (Bornstein, 2014), in order to better serve the higher numbers of children with ID in LMIC worldwide (Pan, 2007). The lack of representation from LMIC is especially significant because of the presence of known differences between these countries and high-income regions, especially differences related to parenting beliefs and caregiving approaches. For example, attitudes regarding child disability is different in LMIC (Gaad, 2004; Fatimilehin and Nadirshaw, 1994; Wong et al., 2004). Parental struggles and priorities in LMIC are also varied, as parents who reside in lower income countries tend to experience higher levels of stress, which indirectly lowers caregiving quality and produces worse child outcomes (Noel et al., 2008). These differences undoubtedly limit the generalizability of existing studies exploring the relationships between ID, caregiving and parental characteristics. In order to obtain findings that are more ecologically valid and generalizable across the LMIC population, the present study therefore focuses on data obtained from parents and their children located in LMIC.

A previous analysis on 13 LMIC (Bizzego et al., 2020) investigated the effect of the severity of child disability on different parenting practices, evidencing that children with more severe developmental disabilities are less cared and more physically punished. However, as the previous analysis only focused on severity of child disability in general, the difference between ID and OD were not considered. The differences between ID and OD in terms of caregiving will now be examined in this work.

1.1 Aim of this Study

This paper aims to investigate whether ID is associated with specific caregiving behaviours of parents and other caregivers, in particular concerning cognitive and socioemotional activities.

In particular, the study aims to answer the following questions:

1. Are children with ID more neglected by their parents than children with other disabilities?
2. Do mothers and fathers behave differently if their child has ID or OD, compared to if their child was typically developing (TD)?

In examining these questions, we also consider the differences between mothers and fathers, the effect of the education of the main caregiver, gender of the child and, more generally, of the socioeconomic development of each country.

Due to the scarcity in relevant current literature on the association between child ID and caregiving in LMIC, our study is exploratory in nature.

Using a large cross-country data set of children in LMIC ($N = 29,525$) and adopting a data-driven approach, we aim to find patterns and provide directions for future research.

2 Methods

2.1 Dataset

Data from the 2005-2007 Multiple Indicator Cluster Survey (MICS) (United Nations Children’s Fund, 2006) was used in this study. Data are public and can be retrieved online from mics.unicef.org. Developed and supported

by UNICEF, MICS is an internationally-conducted household survey that reports data from more than 200 key physical and social indicators impacting the well-being of children, women and men worldwide. The MICS dataset was selected as it is the largest dataset available that involves multiple LMIC countries and investigates multiple aspects of parenting and child development.

MICS consists of separate questionnaires that address macro areas (such as Child development, Quality of the Housing Environment). Each macro area includes a number of modules that examine specific aspects; for example, there would be modules regarding Discipline in the Household macro area and modules regarding Caregiving in "Children under 5" macro area. Each module is targeted at certain members of the household within a given age range. In the present study, some subsets of MICS indicators (described below) were selected from relevant modules in order to extract information about child ID, OD and caregiving practices.

Target households for participation in MICS are selected randomly using a hierarchical process, beginning from census enumeration areas down to segments in each area, and finally narrowing down on the particular households within each segment (Bornstein et al., 2016).

2.2 Participants

The Child Disabilities module targets children aged between 2 and 9 years old and also consists of relevant indicators regarding parenting involvement for parents of children aged below 5. Therefore, the final dataset that is used in the present study resulted from merging the Child Disability module and parenting indicators for children aged between 2 and 5 years. As a single household might host multiple families, we randomly sampled one child for each household and the child's parents.

The unit of this analysis was the child and the caregiving practices the child receives. However, since the role of the child's parents and of the living environment were also considered, each child unit is deeply related to the family and household. The final dataset thus comprises of data from 29,525 children (Boys = 14,973) from 14 different LMICs (Table).

Informed consent was sought at each site where data were collected. The current study protocol is approved by the Internal Review Board of the Nanyang Technological University (IRB-2020-04-040).

Table 1: Partitioning of the sample of the study into the 14 Low and Middle Income Countries, with number of children in each disability group and the Human Development Index (HDI) of each country.

	N	N_{TD}	N_{ID}	N_{OD}	HDI
Albania	668	547	43	78	0.709
Belize	394	225	49	120	0.676
Cameroon	2816	1733	301	782	0.470
Central African Republic	4093	1996	546	1551	0.328
Djibouti	322	156	74	92	0.414
Georgia	1093	759	96	238	0.712
Ghana	1722	1318	131	273	0.518
Lao People's Democratic Republic	2085	1805	116	164	0.511
Mauritania	3939	2531	377	1031	0.479
Mongolia	1883	1380	133	370	0.660
Mozambique	5230	4269	187	774	0.361
Suriname	1174	716	126	332	0.682
Uzbekistan	2457	2366	24	67	0.635
Yemen	1649	1085	212	352	0.478

2.3 Disability and Caregiving categories

2.3.1 Child Intellectual Disability

To identify children with potential ID, the Child Disabilities module was used. The Child Disabilities module is based on “Ten Questions” (see Table 2) that screens, in a binary fashion (i.e. either “Yes/No”), for a range of impairments, but leaves the clinical diagnosis of the actual presence and severity of the disability to other appropriate clinical methods (Mung’ala-Odera et al., 2004; Christianson et al., 2002). The Child Disabilities module is completed by either the mother or primary caregiver of the child.

Three questions are associated with cognitive/intellectual disability: a) When you ask the child to do something, does he/she understand what you say? b) Does the child learn to do thing like other?; c) Compared to other children, does the child appear mentally backward?;

Other questions correspond to other types of disabilities (such as language, sensory, or motor impairment) (Zaman et al., 1990; Hendricks et al., 2014; Bornstein and Hendricks, 2013) (see Table 2).

Based on the answers given by the main caregiver to the “Ten Questions”, we categorized the children into three groups:

1. potential Intellectual Disability (ID): children with at least one reported intellectual disability ($N = 2,415$);
2. potential Other Disabilities (OD): children with at least one reported disability, other than intellectual ($N = 6,224$);
3. Typical Development (TD): all other children ($N = 20,886$). This category of children have typical development.

As the Ten Questions is not a formal tool for clinical diagnosis of child disability, we are unable to definitively conclude if a child represented in the dataset indeed has a disability. Nonetheless, it has been reported that testing positive for a disability using the Ten Questions is significantly correlated to also being diagnosed with a disability during clinical evaluation (UNICEF et al., 2008), and is especially sensitive to severe disability (Durkin et al., 1994; Zaman et al., 1990). Additionally, (Durkin et al., 1995) revealed that the Ten Questions showed good internal and test-retest reliability. Originally designed to be used in resource-poor countries, the Ten Questions is also commonly used measure of child disability in developing countries (Maulik and Darmstadt, 2007), and is therefore ecologically valid.

Table 2: “Ten Questions” that screen for child disabilities. The ”Answer indicating disability” column indicates the answer associated with a potential disability condition.

Question	Answer indicating disability
Q1 Any serious delay sitting, standing or walking?	Yes
Q2 Does she/he have difficulty seeing in daytime or nighttime?	Yes
Q3 Does she/he appear to have difficulty hearing?	Yes
Q4 When you ask her/him to do something, does she/he seem to understand what you say?	No
Q5 Does she/he have difficulty walking or moving?	Yes
Q6 Does she/he have fits, become rigid or lose consciousness	Yes
Q7 Does she/he learn to do thing like other?	No
Q8 Can she/he says recognizable words?	No
Q9A Can she/he name at least one object? (For 2 years old children)	No
Q9B Is her/his speech in any way different from normal? (For children older than 2 years)	Yes
Q10 Compared to other children does she/he appear mentally backward, dull or slow?	Yes

2.3.2 Cognitive and Socioemotional Caregiving

The Caregiving module from the “Questionnaire for Child under Five” of MICS investigates who in the household administers six main caregiving activities with the child. Three activities are related to the cognitive development of the child: ”Read Books”, ”Tell Stories”, ”Spend Time/Name,Count,Draw”, and three others correspond to socioemotional development: ”Sing Songs”, ”Take Outside”, ”Play”. For each activity, three questions ask whether the mother, the father, and other caregivers do the activity.

We categorized the children based on the number of caregiving activities performed. In particular, for each caregiver, we labeled a child as ”neglected” if none of the caregiving activities are performed by the caregiver.

In addition to the caregiving and socioemotional activities, we also considered the total caregiving, including both the cognitive and socioemotional activities. A child is ”neglected” in terms of total caregiving if no activity (cognitive or socioemotional) is performed.

In addition, we also labeled the children that are neglected by all caregivers.

2.3.3 Moderators

In investigating the associations between disability and caregiving, we took into account the possible influence of three moderators: the gender of the child (HL4 indicator, “Questionnaire for Children under Five”), the education of the main caregiver (whether or not the caregiver has ever attended school, ED2 indicator, “Household Questionnaire”), and the socioeconomic

category of the country, quantified by the 2006 Human Development Index described above. From the HDI values, low HDI countries have a HDI value less than 0.5, while high HDI countries have a HDI value equal or more than 0.5.

2.4 Analytical Plan

The objective of the data analysis is to statistically assess whether the presence of disability is associated with increased risk of being neglected.

First we aimed at evaluating the incidence of the disabilities is different for each category of the moderators: for males and females, for caregiver with different education, and for each HDI group. These analyses were performed running a Pearson’s chi-square test comparing the disability group and the categories of each moderator.

Then we investigated whether the three disability groups are associated with a different number of children that are neglected. These analyses were performed running a Pearson’s chi-square test comparing the caregiving (neglected / not neglected) and the disability (TD, ID and OD) categories for each type of caregiving activities (Cognitive, Socioemotional, and Total).

For these first two steps of analysis we also report the standardized residuals of the contingency tables, to quantify the strength of the difference between observed and expected values.

Finally, we also investigated whether the association between disability and caregiving is moderated by the type of parent, child’s gender, education of the main child’s caregiver, and HDI of the country. To this aim, we separately ran the Pearson’s chi-square test comparing the caregiving and the disability categories on each group of the moderating variables.

To quantify the difference between children with ID and with OD with respect to children with TD we reported the Odds Ratio (OR) of being neglected by the caregiver for each disability group (OR_{ID} and OR_{OD}). In addition, we also computed the OR of children with ID with respect to children with OD to quantify the difference between the two types of disability ($OR_{ID/OD}$).

A multilevel logistic regression was finally performed to predict whether the child is neglected, considering the contribution of the type of disability (ID or OD), parent (Mother or Father), gender of child, education of the main child’s caregiver, and Human Development index.

Table 3: Standardized residuals of the contingency tables that compare the number of children in each disability group and the categories of the moderators considered in this study.

	Gender		Education of main caregiver		HDI group	
	Males	Females	Never Attended School	Attended School	Low	High
Typycal Development	-1.02	1.03	-5.46	3.55	-8.83	11.08
Intellectual Disability	1.04	-1.05	6.08	-3.95	5.74	-7.20
Other Disabilities	1.22	-1.24	6.22	-4.04	12.60	-15.80

3 Results

Figure 1: Incidence of child disabilities according by gender of the child (left), education of the main caregiver (middle), and country's HDI group (right).

The incidence of developmental disabilities (see Figure 1) is significantly associated with the child's gender ($\chi^2(2, N = 29,525) = 7.32, p=0.026$, Cramer's $V = 0.016$), education of the main child's caregiver ($\chi^2(2, N = 29,525) = 150.03, p<0.001$, Cramer's $V = 0.071$), and the HDI group of the country ($\chi^2(2, N = 29,525) = 693.95, p<0.001$, Cramer's $V = 0.153$).

The standardized residuals (Table 3) evidence the strong effect of the education of the main caregiver and of the HDI on the incidence of intellectual and other disabilities.

The percentage of Boys with TD is lower (70.04%) than Girls (71.46%); conversely, the percentage of Boys with ID (8.42%) and OD (21.54%) is higher than Girls (ID: 7.93%, OD: 20.61%).

The percentage of children with TD is higher for children with educated caregiver (72.81%) than non-educated caregiver (65.83%); conversely, the

percentage of children with ID and OD is higher for children with non-educated caregiver (ID: 10.04%, OD: 24.13%) than educated caregiver (ID: 7.40%, OD: 19.79%).

With respect to the HDI group of the country, in High HDI countries the percentage of children with TD is higher (79.43%) than Low HDI countries (65.21%); while the percentages of both children with ID and OD are higher in low HDI countries (ID: 9.40%, OD: 25.39%) than high HDI countries (ID: 6.26%, OD: 14.31%).

3.1 Caregiving and Developmental Disabilities

Figure 2: Percentages of neglected children for each category of caregiving activities and caregiver. White colored bars indicate non significant differences between the three groups.

Being neglected by all caregivers is significantly associated with the developmental status (TD, ID and OD), for both the cognitive ($\chi^2(2, N = 29,525) = 18.26, p < 0.001$, Cramer's $V = 0.025$) and socioemotional ($\chi^2(2, N = 29,525) = 13.68, p = 0.001$, Cramer's $V = 0.022$) caregiving activities and for the total caregiving ($\chi^2(2, N = 29,525) = 17.19, p < 0.001$, Cramer's $V = 0.024$).

Table 4: Odd Ratios of being neglected for children with ID (OR_{ID}) and OD (OR_{OD}) with respect to children with No Disabilities; and for children with ID with respect to children with OD ($OR_{ID/OD}$). $OR_{ID/OD}$ s in bold indicate that a significant association was found between the type of disability and the percentage of neglected children.

	N	Cognitive Caregiving			Socioemotional Caregiving			Total Caregiving		
		OR_{ID}	OR_{OD}	$OR_{ID/OD}$	OR_{ID}	OR_{OD}	$OR_{ID/OD}$	OR_{ID}	OR_{OD}	$OR_{ID/OD}$
AllCaregivers	29525	1.22	1.04	1.17	1.21	1.18	1.02	1.25	1.23	1.02
Mother	29525	1.14	1.03	1.11	1.06	1.05	1.01	1.12	1.13	1.00
Father	29525	0.91	0.87	1.05	0.93	0.93	1.00	0.91	0.96	0.95
Others	29525	1.17	1.00	1.18	1.20	1.06	1.14	1.22	1.06	1.14
Boys	14973	1.24	1.06	1.16	1.14	1.11	1.03	1.15	1.09	1.06
Girls	14552	1.20	1.02	1.18	1.30	1.27	1.02	1.37	1.39	0.98
Non educated	8756	0.99	0.80	1.24	1.03	1.12	0.92	1.05	1.16	0.90
Educated	20769	1.26	1.14	1.10	1.25	1.14	1.09	1.31	1.19	1.10
Low HDI	18049	1.00	0.87	1.14	1.12	1.06	1.05	1.16	1.10	1.06
High HDI	11476	1.44	1.03	1.41	1.06	1.04	1.01	1.00	1.01	0.99

With respect to children with TD, all the OR are greater than one (see Table 4, first row, and Figure 2), indicating that children with disabilities are at increased risk of being neglected as compared to children with TD.

The percentage of neglected children is higher for cognitive caregiving activities than socioemotional for all groups. However, among children with disabilities, a significant difference between ID and OD was found only for cognitive caregiving activities ($\chi^2(1, N = 8,639) = 8.72, p = 0.003$, Cramer's $V = 0.032$), with increased risk of being neglected for ID compared to OD ($OR_{ID/OD} = 1.17$).

The standardized residuals (Table 5) evidence the effect of Intellectual Disability to increase the number of children that are neglected in the cognitive caregiving activities. Other disabilities, instead, are more associated to socioemotional and total caregiving activities.

3.1.1 By parent

We also investigate whether mothers and fathers show specific patterns of association between child disability and caregiving (Table 4, and Figure 2).

For mothers, there is a significant association between the type of disability and being neglected for the cognitive ($\chi^2(2, N = 29,525) = 9.52, p=0.009$, Cramer's $V = 0.018$) and total activities ($\chi^2(2, N = 29,525) =$

Table 5: Standardized residuals of the contingency tables that compare the number of neglected children for each disability group

Disability group	Cognitive		Socioemotional		Total	
	Not neglected	Neglected	Not neglected	Neglected	Not neglected	Neglected
Typical Development	0.84	-1.40	0.54	-1.92	0.56	-2.17
Intellectual Disability	-2.01	3.35	-0.51	1.81	-0.50	1.96
Other Disabilities	-0.29	0.48	-0.67	2.39	-0.71	2.75
Intellectual Disability	-1.32	2.13	-0.05	0.18	-0.04	0.13
Other Disabilities	0.82	-1.33	0.03	-0.11	0.02	-0.08

18.16, $p < 0.001$, Cramer's $V = 0.025$), but not for socioemotional activities.

A significant difference between ID and OD was found for cognitive caregiving activities only ($\chi^2(1, N = 8,639) = 4.84$, $p = 0.028$, Cramer's $V = 0.024$), with increased risk of being neglected by the mother for ID compared to OD ($OR_{ID/OD} = 1.11$).

For fathers, this association is significant for cognitive ($\chi^2(2, N = 29,525) = 19.21$, $p < 0.001$, Cramer's $V = 0.026$) and socioemotional caregiving activities ($\chi^2(2, N = 29,525) = 7.42$, $p = 0.024$, Cramer's $V = 0.016$), but not for total activities. No significant difference is found between children with ID and children with OD.

Figure 3: Percentages of neglected children for each category of caregiving activities by education of the main caregiver (left) and HDI group of the country (right). White colored bars indicate non significant differences between the three groups.

3.1.2 By gender of child

For boys, the association between child disability and being neglected is significant only for cognitive caregiving activities ($\chi^2(2, N = 14,973) = 11.59$, $p = 0.003$, Cramer's $V = 0.028$); while all categories are significantly associated for girls (Cognitive: $\chi^2(2, N = 14,552) = 7.13$, $p = 0.028$, Cramer's $V = 0.022$; Socioemotional: $\chi^2(2, N = 14,552) = 13.18$, $p = 0.001$, Cramer's $V = 0.030$; Total: $\chi^2(2, N = 14,552) = 20.45$, $p < 0.001$, Cramer's $V = 0.037$).

A significant difference between ID and OD was found only for cognitive caregiving activities for both Boys ($\chi^2(1, N = 4,486) = 4.20$, $p = 0.040$, Cramer's $V = 0.031$, $OR_{ID/OD} = 1.16$) and Girls ($\chi^2(1, N = 4,153) = 4.35$, $p = 0.037$, Cramer's $V = 0.032$, $OR_{ID/OD} = 1.18$), indicating an increased risk of being neglected for children with ID.

3.1.3 By education of primary caregiver

For non-educated caregivers, the association between child disability and being neglected is significant only for caregiving activities ($\chi^2(2, N = 8,756) = 18.39$, $p < 0.001$, Cramer's $V = 0.046$), while all categories are significantly associated for educated caregivers (Cognitive: $\chi^2(2, N = 20,769) = 21.20$, $p < 0.001$, Cramer's $V = 0.032$; Socioemotional: $\chi^2(2, N = 6,621) = 11.621$, $p = 0.037$, Cramer's $V = 0.018$; Total: $\chi^2(2, N = 20,769) = 9.15$, $p = 0.010$, Cramer's $V = 0.021$).

A significant difference between ID and OD was found only for cognitive caregiving activities for non educated caregivers ($\chi^2(1, N = 2,992) = 6.56$, $p = 0.010$, Cramer's $V = 0.047$, $OR_{ID/OD} = 1.24$).

3.1.4 By HDI group

When considering the HDI group of the country, the association between child disability and being neglected is significant only for caregiving activities for both low HDI ($\chi^2(2, N = 18,049) = 13.31$, $p = 0.001$, Cramer's $V = 0.027$), and high HDI ($\chi^2(2, N = 11,476) = 15.47$, $p < 0.001$, Cramer's $V = 0.037$), countries.

For cognitive caregiving activities we also found a significant difference between ID and OD for both low ($\chi^2(1, N = 6,279) = 4.77$, $p = 0.029$, Cramer's $V = 0.028$, $OR_{ID/OD} = 1.14$) and high ($\chi^2(1, N = 2,360) = 9.13$, $p = 0.003$, Cramer's $V = 0.062$, $OR_{ID/OD} = 1.41$) HDI countries, indicating an increased risk of being neglected for children with ID.

Table 6: Results of the multilevel logistic regression, with the coefficient and p-value of each term, for the three types of caregiving activities.

	Cognitive		Socioemotional		Total	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Intellectual disability group	-0.0433	0.008818	-0.0101	0.535191	0.00552	0.733685
Parent	0.52264	<0.000001	0.67523	<0.000001	0.65196	<0.000001
Gender of child	-0.0172	0.295517	0.02089	0.197527	0.01727	0.286291
Education of caregiver	-0.1125	<0.000001	-0.0371	0.026967	-0.0554	0.000903
Human Development Index	-0.2519	<0.000001	-0.2802	<0.000001	-0.265	<0.000001

3.2 Multilevel Logistic Regression

The results of the multilevel logistic regression (Table 6 confirmed the Pearson χ^2 results, showing that the difference between ID and OD is significant for the cognitive caregiving activities. The type of parent, education of the main caregiver and the HDI of the country are also significant in predicting whether the child is neglected.

4 Discussion

From the exploratory analysis of the incidence of general child disability and population characteristics (namely, child gender, level of education of parents, and country HDI), three main findings were uncovered. Firstly, there is significant difference in the incidence of child disability between male and female children, with males more likely to have ID and OD than females. This is in line with multiple studies that had previously revealed higher male prevalence in ID (Lai et al., 2012b), autism spectrum disorder (Lai et al., 2012a), and certain learning disabilities such as dyslexia (Chan et al., 2007).

Secondly, child disability is generally more prevalent among non-educated parents. Thirdly, child disability is also generally more prevalent in countries with lower HDI, corresponding to lower socioeconomic statuses (Programme, 2019; Deb, 2015). According to the standardized residuals reported in the above section, parental education and HDI demonstrate robust effects in the difference in prevalence of children with ID and OD, especially when compared to the prevalence of children with TD. The second and third findings may in fact be inter-related. These findings aligned with findings from other global studies across the world that reported greater prevalence of disability in low-income households (Boyle et al., 2011; Leonard et al., 2005; Magnus,

2000; Drews et al., 1995). Coupled with the finding that there are higher barriers to entry in accessing education in LMICs (Lynch and O’riordan, 1998; King and Hill, 1993), it may be as (Emerson, 2012) posited: that LMICs present with greater instances of adverse conditions that are both detrimental to the prenatal and postpartum development of the child that result in delayed child development as well as to the opportunities given to parents to pursue education. Alternatively, another theory suggested by (Dubow et al., 2009) relating to education level, income and child development posits that parents who were not educated are less prepared to model behaviours that are adaptive for their child to develop optimally. Uneducated parents are more commonly residing in LMICs, due to the lack of opportunity and ability to secure higher-paying jobs elsewhere (Kenn, 2016). Both theories would support this pattern of findings in the present study; however, further research is required to clarify which theory is more relevant in explaining the direction of the relationships between education, HDI and child disability.

Moreover, it is noted that among the children who have been classified to have a disability using the Ten Questions tool, we are unable to distinguish between children who have only mild symptoms of disability, and therefore would not receive a formal diagnosis, and children who would qualify for a clinical diagnosis of disability.

According to (Zaman et al., 1990), of the children who did not receive a formal diagnosis despite testing positive in the Ten Questions (78%), although 70% of these children had a form of mild disability or health condition, 30% had no disability. Therefore, the significant values from the OD and ID samples likely are contributed by an even smaller group of children. The uncovered effect sizes are likely to then be even stronger than is reported in this present study, if we exclude up to 30% of non-clinically positive cases.

4.1 Caregiving and Developmental Disabilities

Examining child disability with parental caregiving, it was revealed that children with developmental disabilities are generally more likely to be neglected by all caregivers (mothers, fathers and other caregivers), and that this neglect was more prominent in cognitive caregiving as compared to socioemotional caregiving. Specifically, among children with disabilities, children with ID are also more likely to be neglected in the area of cognitive caregiving as compared to OD, with a particularly large effect size as calculated by the standardized residuals reported in the previous section. This finding is sup-

ported by different studies, making use of a range of methodologies, that consistently found child developmental disability to be a risk factor for neglect in caregiving (Leeb et al., 2012; Eshbaugh et al., 2011; Hibbard et al., 2007; Embry, 2001). The difference in level of neglect of children with developmental disabilities has been found to be three times that of a typical child (Sullivan and Knutson, 2000). (Stormont, 2001) posited that this may be due to the difficulty in sustaining a warm responsive parenting style towards children with developmental disabilities. As the maintenance of parents' caregiving behaviour correlates to their child's level of receptiveness (Wheeler et al., 2007), a lack of social feedback from the children would discourage caregivers from continuing with their caregiving activities. This is especially pertinent as developmental disabilities manifest behaviourally and physically with signs and symptoms that reduce the likelihood of active parent-child interaction (Warren and Brady, 2007). Examples of these symptoms may be low rates of social initiation that reduces the frequency of parent-child interaction, and avoidant gaze which decreases social engagement.

The significant difference in cognitive caregiving, especially between children with ID and OD, may be attributed to similar reasons. Drawing reference from the transactional model of development proposed by (Sameroff, 2009), both caregiver and child are involved in a dynamic, changing interaction where both parties play a role in shaping the developmental outcomes and the external environment which either reinforce or undermine the effects of the interaction. In the case of cognitive caregiving, the differences in the ability to interact and engage cognitively with a child with ID compared to a child with OD or TD become more salient due to the nature of ID. These differences may be exacerbated in the environmental context of LMICs where child-friendly resources such as picture books or educational toys are less common. Caregivers are then required to rely on their own effort and available resources to engage in cognitive caregiving with their child with little external support, which can quickly become discouraging to the caregivers. Conversely, neglectful caregiving can also lead to significantly delayed cognitive development (Strathearn et al., 2001). Together, these directions of interactions within the dynamics of parent, child and the environment may form a negative, even destructive, cycle of parent-child transactions.

4.1.1 Analysis by parent

When examining caregiving practices by fathers, mothers and other caregivers separately, it emerged that children with disabilities tended to be more neglected by mothers. Specifically, in the area of cognitive caregiving, children with ID are significantly more neglected than children with OD. On the other hand, fathers showed significant correlation in cognitive caregiving neglect and type of disability, but there was no significant difference between ID and OD for any aspect of paternal caregiving. As explained above, the difference in level of neglect for cognitive caregiving among both mothers and fathers may be due to the nature of ID symptoms, which increases the difficulty of engaging the child cognitively.

4.1.2 Analysis by gender of child

Findings revealed that the gender of the child also played a significant role in the likelihood of caregiving neglect, especially for girls who were disabled, who were significantly more likely to be neglected for both cognitive and socioemotional caregiving, as well as overall caregiving measures. Between the ID and OD groups, however, both boys and girls with ID were more likely to be neglected along the cognitive domain than children with OD, which was discussed in the previous section. The higher likelihood of neglect among female children with disability seems in contrast with some findings reporting higher neglect among male children (Egry et al., 2015), and especially among male children with disability (Hua et al., 2014; Sobsey et al., 1997), as well as studies that found no significant difference in child gender on neglect (Cui et al., 2016). The present findings may present a different definition of neglect as compared to the above cited research, which contained multiple aspects of child neglect ranging from structural, medical, educational neglect to affective and psychological neglect (Sobsey et al., 1997), as well as deprivation of protection (Egry et al., 2015). As neglect in this study focused only on neglect in socioemotional and cognitive nurturance, our findings may have captured a difference in gender profile for different categories of child neglect. As explained by (Cui et al., 2016), the levels of neglect may be viewed in conjunction with gender-linked expectations of children. For example, male children are more likely to face higher expectations from parents in terms of abilities, educational attainment and eventual old-age support of the parents (Hannum et al., 2009), which may explain the higher level of caregiving af-

forded to male children as compared to female children, who are consequently more likely to be neglected.

4.1.3 Analysis by education level

Analysing the results based on the education level of primary caregiver, it emerged that for educated caregivers, there is significant difference in the level of neglect towards children depending on disability status in both cognitive and socioemotional aspects of caregiving. Additionally, in cognitive caregiving, children with ID are more likely to be neglected than children with OD. These results might be explained by considering the relative burden of caring for a child with disability. According to (Green, 2007), there are two sources of burden when caring for child disability, namely objective and subjective burden. Objective burden refers to socio-structural constraints, such as the tangible or monetary resources that are required by the parents, or the availability of public health infrastructure to support child disability. Subjective burden refers to non-quantifiable emotional distress that caregivers face in the daily tasks of caregiving. As a higher level of educational attainment is typically correlated with higher-paying careers and therefore more financial resources (Gregorio and Lee, 2002), it can be reasoned that objective burden faced by more educated caregivers is relatively lower. However, the social stigma associated with child disability (Currie and Szabo, 2020; Ellen Selman et al., 2018; Thrush and Hyder, 2014) and social withdrawal or isolation as a result of such stigma (Ngo et al., 2012) is a significant source of subjective burden. As caregivers who are more educated have more social capital and thus more to lose (Green et al., 2012), the burden of social stigma and withdrawal may be greater compared to uneducated caregivers. Significantly, findings from (Ngo et al., 2012) point specifically to the elevated social exclusion, labelling, and need to hide the child's condition in the case of ID, which may explain the significant difference even in the level of neglect between children with ID and OD. Qualitative findings also suggested several reasons for this discrepancy being the prevailing norm that children with ID are unable to be employed (Ngo et al., 2012), which is a concern that perhaps is more salient to more educated caregivers who are able to command higher salaries from their employment. Overall, this may lead to a net increase in burden for more educated caregivers, which then translated into lower quality of caregiving and greater neglect in the present findings.

On the other hand, non-educated caregivers are significantly more likely

to neglect cognitive compared to socioemotional aspects of caregiving when parenting a child with disability. Taking into account the same model of relative burden in caring (Green, 2007), we propose that the pattern of findings among non-educated caregivers are due to high objective burden. The nature of cognitive caregiving as characterised by MICS includes the use of educational resources such as storybooks and other objects around the house (to count, draw, and tell the time with), which increase the level of objective burden. Taken together with the fact that children with disabilities will require specialised tools and resources to do the same activities (such as simplified books for children with ID or larger typefont for children with visual impairment), less educated caregivers with a smaller amount of dispensable income (Gregorio and Lee, 2002) may face greater difficulty in accessing and providing resources for cognitive caregiving of children with disabilities.

4.1.4 Analysis by HDI

Finally, findings when analysing by HDI level showed that caregivers from both low and high HDI countries show greater neglect in cognitive caregiving towards children with disabilities in general. Children with ID are also more neglected than children with OD in this aspect. These findings may be less reflective of difference in terms of HDI status, but rather more reflective of generally greater neglect of children with disabilities and especially ID in terms of cognitive caregiving. This aligns with long-established findings that children with ID spend overall less time in activities that were cognitive in nature (Ehrmann et al., 1995; Margalit, 1984; Matthews, 1979). The neglect by caregivers in the area of cognitive caregiving may be due to a history of viewing child ID under the lens of a health problem, rather than an educational one, as it was perceived that children with ID cannot be educated or developed cognitively. The prevailing perception of child ID is powerful in parental beliefs of the efficacy of cognitive caregiving of said child, which translates to whether or not the caregivers choose to engage in cognitive caregiving for a child with ID (Mutua and Dimitrov, 2001; Danseco, 1997). This was the case for child ID in England in the 1970s, prior to introducing educational policies for children with ID (Mittler, 2002). The perception of child ID from a biomedical health model rather than a biopsychosocial model also entailed that caregivers and parents often were not working effectively with professional healthcare personnel to deliver whole-person care for the child (Rogers, 2011).

5 Limitations

As with all studies, the present study has several limitations in the methodology. Due to the usage of MICS as the dataset analysed, the obtained data and criteria of child disability was not based on a clinical assessment of developmental disability. A clinical assessment and diagnosis of child disability has several benefits. Firstly, as outlined above, a clinical assessment may be better able to rule out false positives which would in turn strengthen the effect sizes reported in the present study. Secondly, clinical diagnoses would enable a standardization of child disability internationally, which is of critical importance in a cross-national study. Thirdly, a clinical diagnosis may be able to provide further insight into the specific type of disability and its severity, both of which are factors that moderate the caregivers' choice of caregiving strategy or lack thereof (Wei and Jennifer, 2012; Eddy and Engel, 2008; Jaudes and Shapiro, 1999). Additionally, as disability brings about social stigma and some households may face negative perception from others regarding their child's developmental status (Werner and Shulman, 2013) and their caregiving practices, there may be issues of social desirability (Bornstein et al., 2015) due to the self-report nature of MICS. Future studies may wish to consider other modes of data collection that can supplement self-reported questionnaire data. Lastly, the dataset obtained from MICS is based on a cross-sectional study, and only correlational analyses can be conducted. Therefore, this study is unable to ascertain causal relationships between the factors identified above.

6 Implications

Notwithstanding, the current study sheds light upon parenting practices depending on developmental status of the child in LMICs. The above findings have highlighted a significant gap in the caregiving practices for children with ID, and especially in the area of cognitive caregiving, in LMICs. The present study marks an important step towards understanding the current situation of child intellectual disability in countries that have typically been under-represented in empirical studies, and attempts to apply existing models and theories of child ID and caregiving in a new context based on data-driven methods. It is seen that caregivers tend to neglect children with ID more so than children with OD or typical development, and may be attributable

to the stigma of ID, as well as the lack of knowledge of how best to engage cognitively with children with ID.

Through this study, it is hoped that vulnerable children with ID can receive higher quality caregiving. In LMICs, lower levels of caregiving and higher neglect may be better explained by larger sociological constructs such as SES, education and healthcare infrastructure (Kotch et al., 1995), while the same pattern of caregiving and neglect in countries of high income may more likely be due to individual parenting factors such as parenting stress (Dubowitz and Bennett, 2007). In (Bywaters et al., 2016) and (Slack et al., 2004) work investigating SES and neglect, SES is better characterized by the level of economic hardship experienced, which was predictive of level of child neglect. Individual parenting characteristics were then found to moderate this relationship between economic hardship and neglect (Slack et al., 2004). In the context of LMICs where economic hardship is more salient, it may be prudent to empower parents in LMICs through comprehensive establishment of economic, educational and social safety nets to address the main relationship between poverty and child neglect, rather than targeted parenting interventions. The findings suggest that LMICs may also consider large-scale destigmatization campaigns and specialized caregiver education regarding child ID to be useful in filling in the gap of cognitive caregiving for children with ID.

Author contribution

A.B. and G.E conceived the study, A.B. and G.S. processed and analyzed the data; G.G. curated the data and the public repository; A.B. and M.L. wrote the draft of the manuscript; all authors read and approved the final version of the manuscript.

Conflicts of interest

The authors declare no conflict of interest.

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