Early Childhood Development Risks and Protective Factors in Vulnerable Preschool Children from Low-Income Communities in South Africa

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Abstract

Age-appropriate early childhood development is greatly influenced by exposure to various mediating and moderating factors. Developmental outcomes cannot be viewed in isolation, but by considering the interaction of the various risks and protective factors that influence early child development. A non-experimental, cross-sectional research design was employed. Data was collected in a low-income community in Gauteng, South Africa. Caregivers with children (n = 276) between the ages of 3 years and 6 years 11 months (mean 51.57 months; SD ± 12.4) whose children were in a preschool were invited to participate in the research study. Participants were divided into two groups, children with developmental delays and children without a developmental delay. The study sample included high risk, vulnerable preschool children, with a developmental delay prevalence of 80.1% (221/276). Families included were exposed to an average of five (SD ± 1.86) environmental and/or biological risks. According to a logistic regression model, three factors were significantly associated with increasing resilience amongst children with no developmental delay: living with both parents ($p < 0.031$, OR 4.5, 95% CI 1.2–17.2), caregivers having at least completed Grade 8 to 12 ($p < 0.027$, OR 11.9, 95% CI 1.4–10.5) and parents being married ($p < 0.023$, OR 5.1, 95% CI 1.3–20.9). Important protective factors in low-income communities like caregiver education, living with both parents and parental marriage can inform public health messaging and other population-based interventions to support early childhood development.

Keywords: Low-income; Socio-economic status; Early childhood development; Risks; Protective factors

Introduction

Age-appropriate early childhood development is greatly influenced by exposure to various mediating and moderating factors [1, 2]. Developmental outcomes cannot be viewed in isolation, but by considering the interaction of the various risks and protective factors that influence early childhood development [3].

Low socio-economic status (SES) is one of the main reasons that children do not reach their full developmental potential when compared to their same-aged, higher SES peers [4, 5]. SES is used globally to classify persons based on occupation, income and level of education [6]. Children from low SES families often enter preschool with less linguistic knowledge and exposure which influences later educational success [7], making them vulnerable to poor school attendance, school dropout and not furthering education after high school [8]. Poor academic performance occurs due to lack of resources to stimulate early literacy skills [9] and less experiences that promote development of acquisition of these skills [10].

Apart from the associations between low SES and education, physical health and wellbeing may also be impacted. Low SES often leads to poorer health outcomes in vulnerable children [4, 11] which ultimately impacts childhood development [12]. Families with low SES often cannot access adequate health care due to travelling costs, distances to the nearest health center and lack of knowledge on when to visit a specific health care professsional [5]. Furthermore, poorer health outcomes may be ascribed to inadequate nutrition for cognitive development and physical growth [12–14]. Therefore, health outcomes in children vulnerable to developmental delays needs to be considered when exploring early childhood development.

Environmental factors such as family dynamics and its association with developmental outcomes is well established [4, 15]. The effect of SES can greatly impact family interactions and in turn have an effect on early childhood development. Families with lower SES tend to have higher amounts of stress which may lead to adult depression and can hinder optimal caregiver-child reciprocity and caregiver responsiveness [16]. Poorer caregiver responsiveness includes less attention, emotional and instrumental support to children [16]. Furthermore, lower education levels in families from lower SES backgrounds often lead to higher caregiver unemployment rates. This may hinder means to provide their children with resources to enriched learning environments [17]. In contrast, warm, responsive caregiving may act as buffers against childhood adversity [18, 19].

Despite all the mediating risks making these children vulnerable to developmental delay, it is apparent that some children show resilience from adversity faced in their daily functioning [20]. Insufficient attention is, however, paid to how children thrive and adapt to overcome adversity and economic hardship within their environment [20, 21]. Often, resilience in family structures are developed because of adverse experiences [22]. Recent work highlight aspects that may act as moderators against developmental delay within families, especially low-income South African families and their children [21]. One aspect that contributes to family resilience is reliance on and support from the surrounding community [23]. Caregivers from a rural community in South Africa reported that the ability to capitalize on cooperative relationships and support structures within their community were the biggest moderators to providing supportive care to their children [21]. Another aspect is established roles of caregivers and family members, as it maintains connectedness by augmenting caregiver authority [24]. Furthermore, caregivers have multidimensional and flexible protective influences on child development [25]. Caregivers that are supportive and responsive may facilitate stress exposure, which can result in positive child growth and development [26].

Except for responsive caregiving, regular and early attendance of preschool also promote early child development in low-income children [10, 25, 27, 28]. Furthermore, structured social interaction occurring in school contributes to resilience in preschool-aged children [20]. The age cohort of the current study therefore aimed to describe the risks and protective factors that influence early childhood development in vulnerable children who are already attending preschool. Identifying the various factors will contribute to strategies in interventions that occur in a timely manner, towards optimal developmental outcomes.

Method

Study Objective

To describe the risks and protective factors influencing early childhood development in vulnerable preschool children.

Study Design

A non-experimental, cross-sectional two-group research design was employed [29]. Probability, stratified random sampling was implemented [29, 30]. Participants were

divided into two groups, children with developmental delays and children without developmental delays.

Setting and Participants

Data was collected in the eastern suburbs in the City of Tshwane, in settings affected by, amongst others, poverty, unemployment and undernutrition. Eersterust, Nellmapius, Mamelodi and Willowlane Village are within a 20 km radius from one another and house approximately 15% of the City of Tshwane population [31]. Within these peri-urban communities, approximately 40% of people are unemployed and earn no monthly income [31].

Seven preschools were involved in the research study. These preschools are mostly run from the principal's house (71.4%; 5/7) with early childhood development (ECD) practitioners not formally trained in providing ECD services. It is currently estimated that at least 50% of all ECD practitioners in South Africa are unqualified with minimal to no training in ECD and care [32]. Caregivers with children (n = 276) between the ages of 3 years and 6 years 11 months (mean 51.57 months; SD ± 12.4) and whose children were in a preschool were invited to participate in the research study. Informed consent was obtained from each caregiver who volunteered to participate in the study. All caregivers who participated were older than 18 years of age.

Data collection took place at the various participating preschools during a quarterly scheduled parent evening or information session held by the respective schools. Children in the study sample are part of a high risk, vulnerable population, as 98.6% (272/276) of children were exposed to at least three developmental risks. Of the children, 64.2% (174/271) were exposed to at least two languages within their immediate environment. Most of the families (66.4%; n = 146) lived on a monthly income of less than $137.

Caregivers were required to have conversational English abilities in order to complete the background information questionnaire and the Vineland-3 caregiver-completed assessment form.

Materials and Apparatus

The Vineland Adaptive Behavior Scales, Third Edition (Vineland-3) [33] was used to assess all children's development. The Vineland-3 is a measure for evaluation of adaptive functioning of individuals from birth to age ninety. Administration time can vary from 10 to 40 min, depending on the administration format selected [34]. The Vineland-3 consists of a comprehensive and domain-level version which are either completed by a caregiver, health-care professional or teacher. Four core developmental domains (communication, daily living skills, motor skills and socialization) are evaluated when using the Vineland-3. The tool was standardized and has adequate internal consistency (between 0.86 to 0.99) and test–retest reliability (between 0.62 and 0.94) [34]. For this study, the Vineland-3 Comprehensive caregiver form was completed by each caregiver.

All participants were asked to complete a detailed close-ended background information questionnaire, in order for the researcher to identify the environmental and biological risks (i.e. developmental risks) and protective factors that all children within the sample population are exposed to (Table 1). An existing questionnaire was amended [35, 36].

Table 1 Developmental risks and protective factors identified in sample population as depicted in Fig. 1

Category	Developmental risks	Protective factors
Language exposure	Multiple language exposure	Exposure to primary language only
Primary caregiver	Single caregiver-headed household	Living with both parents
Gender	Male gender	Female gender
Primary caregiver qualification	No formal schooling/low education level	Matric or tertiary qualification
Amount of children in household	More than three children per household	Three children or less per household
Age of mother	Mother younger than 18 or older than 37 years	Mother aged between 18 and 37 years
Monthly income	Monthly income of $340 or less	Monthly income higher than $340
Primary caregiver employment	Caregiver unemployment	Employed caregiver
Preterm birth	Premature birth	Full term birth
Breastfeeding	No breastfeeding/formula feeds	Breastfeeding

Data Collection Procedures

IRB approval was obtained (GW20180826HS). Caregivers, who attended quarterly parent evenings or information sessions at the preschools, were provided with information regarding the aim of the study and procedures that will be followed. After the information session, caregivers who met the inclusion criteria with children in the required age range and who volunteered to participate in the research study provided informed consent. After informed consent was obtained, caregivers were asked to complete the background information questionnaire and the Vineland-3 comprehensive caregiver form. The researcher then scored the Vineland-3 to determine whether children had a developmental delay. Caregivers of children identified as having a developmental delay in one or more developmental domain were contacted via sms and were referred to relevant healthcare professionals.

Data Analysis

The Statistic Package Social Sciences (SPSS) v 24 (Chicago, Illinois) was used for statistical calculations and analyses. Descriptive statistics were used to describe the type and number of developmental risks children were exposed to. Shapiro–Wilk test of normality was done to determine whether data is normally distributed. A Kendall's tau-b correlation was run to determine the relationship between age and developmental delay. Chi-Square test of association was used to determine statistical significance between risks, protective factors and developmental outcomes. A binomial logistic regression was used to determine the factors that predict developmental delays or the resilience thereof.

Results

Of the total sample population (n = 276), males (45.3%; n = 125) and females (54.7%; n = 151) were almost equally distributed. The average age of the children were 51.57 months (SD ± 12.4). Almost half of the children were between the ages of 3 years and 3 years 11 months (43.5%; n = 120) with the smallest proportion in the 6 years to 6 years 11 months category (7.6%; n = 21) (Table 2). All the children in the current study were from a high risk, vulnerable population, with a developmental delay prevalence rate of 80.1% (221/276). Children were exposed to various developmental risks and protective factors. Families included in the current study were exposed to an average of five (SD ± 1.9) environmental and/or biological risks, with 18.8% (n = 52) of children exposed to eight or more risks (Fig. 1; Table 1).

Table 2 Participant description including risks and protective factor distribution

	Delay % (n)	No delay % (n)	p-value*
Age (n = 276)			0.009
3 years–3 years 11 months (n = 120)	85.8 (103)	23.9 (17)	
4 years–4 years 11 months (n = 76)	78.9 (60)	21.1 (16)	
5 years–5 years 11 months (n = 59)	72.9 (43)	27.1 (16)	
6 years–6 years 11 months (n = 21)	71.4 (15)	28.6 (6)	
Gender (n = 276)			0.244
Male (n = 125)	82.4 (103)	17.6 (22)	
Female (n = 151)	78.1 (118)	21.9 (33)	
Language exposure (n = 271)			0.000
One language	26.2 (71)	1.1 (3)	
2–4 languages	45.8 (124)	14.8 (40)	
5 + languages	8.5 (23)	3.7 (10)	
Primary caregiver (n = 270)			0.005
Single parent	30.7 (83)	8.5 (23)	
Both parents	46.3 (125)	8.1 (22)	
Other	3.3 (9)	3.0 (8)	
Primary caregiver qualification (n = 276)			0.000
No formal schooling	22.5 (62)	2.2 (6)	
Less than Grade 8	22.8 (63)	0.7 (2)	
Grade 8–12	23.9 (66)	11.6 (32)	
Diploma/degree	10.9 (30)	5.4 (15)	
Monthly income (n = 220)			0.000
$0–136	66.4 (146)	4.5 (10)	
$137–340	9.5 (21)	4.5 (10)	
$341 +	8.2 (18)	6.8 (15)	
Age of mother (n = 255)			0.001
Younger than 18	0.4 (1)	0	
18–37 years	72.2 (184)	13.3 (34)	
38 years +	8.2 (21)	5.9 (15)	
Household dynamics			
People in household (n = 256)			0.078
Less than 4	48.8 (125)	9.0 (23)	
5–9	29.3 (75)	10.5 (27)	
More than 10	1.6 (4)	0.8 (2)	
Children in household (n = 273)			0.996
1–2	40.6 (111)	10.0 (27)	
3 +	39.9 (109)	9.5 (26)	
Housing status (n = 273)			0.056
Own house	26.4 (72)	5.1 (14)	
Informal housing	11.7 (32)	2.2 (6)	
Renting	30.8 (84)	3.7 (10)	
Staying with others	11.7 (32)	8.4 (23)	
Marital status (n = 273)			0.000
Not married	20.1 (55)	12.1 (33)	
Married	46.9 (128)	4.8 (13)	
Living together	13.6 (37)	2.6 (7)	
Primary caregiver employment (n = 276)			0.063
No	54.3 (150)	10.9 (30)	
Yes	25.7 (71)	9.1 (25)	
Preterm birth (n = 276)			0.411
Yes	7.2 (20)	2.5 (7)	
No	72.8 (201)	17.4 (48)	
Breastfeeding (n = 266)			0.000
Yes	76.7 (204)	15.4 (41)	
No	3.4 (9)	4.5 (12)	

*p-value of ≤ 0.05 is considered statistically significant

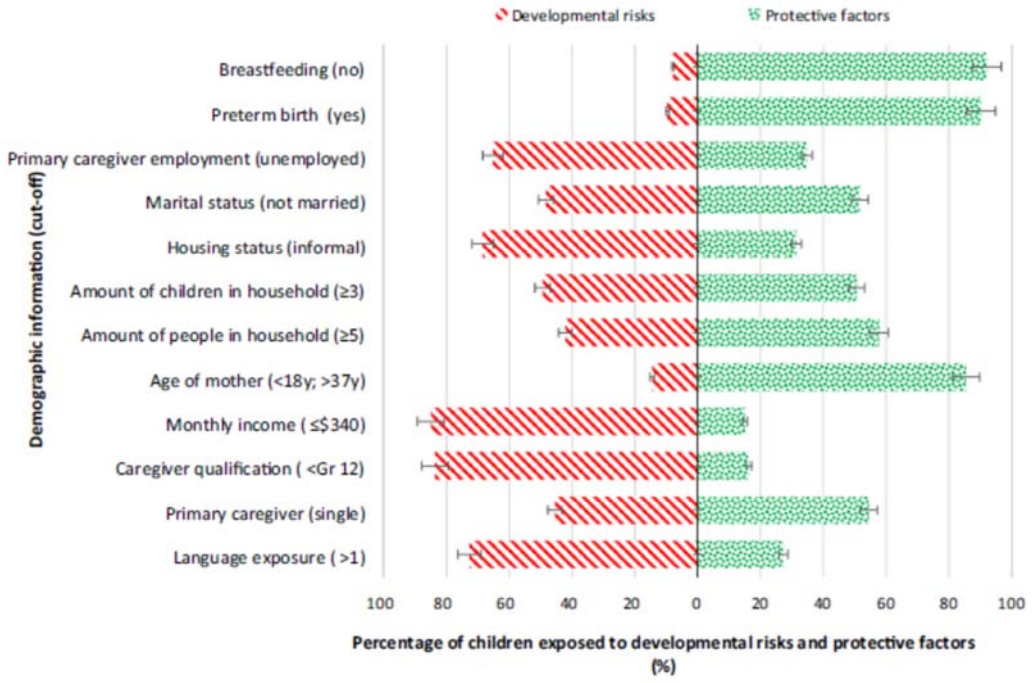

Fig. 1 Child exposure (%) to developmental risks and protective factors, with cut-off scores indicating the classification of risks

Child age and developmental delay were skewed (0.58; SE = 0.16, $p < 0.001$; Shapiro –Wilk) with a normally distributed kurtosis of − 0.48 (SE = 0.33). There was a positive association between developmental delay and child age, which was statistically significant ($\tau_b = 0.13$, $p < 0.010$; Kendall's tau-b). Children exposed to more than one language were more at risk of developmental delay ($p < 0.001$; Chi-Square). Developmental delays were also statistically significant to single caregiver-headed households ($p < 0.006$; Chi-Square), primary caregiver education less than Grade 12 ($p < 0.001$; Chi-Square), monthly income less than $137 ($p < 0.001$; Chi-Square) and unmarried parents ($p < 0.001$; Chi-Square).

Fifty-five children (19.9%) in the current study did not have a developmental delay, despite exposure to various environmental and/or biological (i.e. developmental) risks. Within this group of resilient children, 32.7% (n = 18) were exposed to three to five developmental risks and 67.3% (n = 37) were exposed to six or more developmental risks ($p < 0.018$; Chi-Square).

A logistic regression was performed to determine the effect of statistically significant risks (according to Chi-Square in Table 2) on the resilience of children without develop-mental delays (Table 3). Linearity of the continuous variable (child age) with respect to the logit of the dependent variable (developmental outcome) was assessed using the Box-Tidwell (1962) procedure. Based on this assessment, child age was found to be linearly related to the logit of the dependent variable. The model was found to be statistically significant, χ^2 (16) = 84.55; $p < 0.001$, indicating a good fit. The model correctly classified 83.2% of children with no delay, when no developmental risks were considered in the model. With the developmental risks considered in the model, the model correctly classified 88.1% of children with no developmental delay. Sensitivity of the regression model was 52.9% and specificity 95.2%, with a positive predictive value (PPV) of 69.2% and negative predictive value (NPV) of 90.9%. Of the predictive variables included in the regression model, only three were statistically significant as to increasing resilience amongst children with no developmental

delay: living with both parents, caregivers having at least completed Grade 8–Grade 12 and parents being married (Table 3).

Table 3 Binomial logistic regression predicting likelihood of no developmental delay based on caregiver, caregiver qualification, caregiver marital status, breastfeeding and income higher than $340

Predictive variables	*B*	SE	Wald	*df*	*p*	Odds Ratio (OR)	95% CI for odds ratio	
							Lower	Upper
Living with both parents	1.49	0.69	4.98	1	0.030	4.46	1.15	17.24
Caregivers completed Gr 8–12	2.47	1.11	4.98	1	0.026	11.88	1.35	10.46
Married parents	1.64	0.72	5.21	1	0.022	5.14	1.26	20.94
Breastfeeding	1.31	0.77	2.86	1	0.091	3.68	0.81	16.75
Monthly income more than $340	−0.19	0.73	0.07	1	0.79	0.82	0.19	3.46

Discussion

Families in the current study were from a vulnerable low-income population with exposure to multiple risks and adversities. The cumulative effect of risks on child development are well described [2, 4, 25, 37, 38] and are reflected in the high prevalence of developmental delays (80.1%) in the population sample.

The current study found a positive association between child age and developmental delay ($\tau b = 0.131$, $p < 0.010$), especially as children get older. Several studies have reported similar findings [36, 39, 40]. This may be due to delays becoming more prominent when children are not academically performing as expected [39]. Additionally, epigenetic changes due to adverse childhood experiences may only reflect in later childhood [40]. Although epigenetics were not evaluated in this study, the result of negative childhood experiences on developmental outcomes in older children were evident in the current study.

Children exposed to multiple languages in the home environment were statistically more at risk of having a developmental delay ($p < 0.001$). Consequently, close attention should be paid to multiple language exposure in the home environment [41], especially in young, vulnerable children. Language development of children growing up in a multilingual home may differ from those exposed to only one language. This mainly depends on age, quality and quantity of exposure [42]. Children from a multilingual background often present with poorer academic outcomes due to poorer reading abilities and limited vocabulary. This may occur due to divided language experiences [43]. In contrast, studies have shown that children exposed to multiple language often perform better than monolingual children on theory-of-mind tasks, executive function and improved sociolinguistic communication abilities [44, 45]. Future research is needed to clarify the link between multiple language exposure and academic outcomes, amidst exposure to additional developmental risks.

Several environmental factors, which are often linked to poverty, were identified in the current study as statistically
significant risks to developmental delay. These included single caregiver-headed households ($p < 0.006$), low caregiver education ($p < 0.001$) and low monthly income ($p < 0.001$). Previous studies reported a direct link between poverty and delays in all domains of child development [4, 5]. This may be due to the levels of stress that poverty place upon caregivers, leaving cognitive stimulation to be of minimal priority compared to food security, health and stable income [16]. Preschool children from LMICs, especially in South Africa, are at a significant cognitive disadvantage due to, amongst others, economic hardship [46], lower caregiver education [47] and single caregiver-headed households [21].

While many developmental risks were identified in the current study, protective factors were also present, contributing to shaping a more resilient group of children (19.9%) within the sample population. These children did not have any developmental delays, despite being exposed to developmental risks. Extensive research have shown the impact that

protective factors can have on supporting childhood development, despite exposure to developmental risks [11, 20, 25]. The strongest protective factors described in literature include responsive caregiver-child relationships and health-promoting environments [48, 49]. The current study identified three significant environmental factors contributing to resilience to developmental delays, which included living with two caregivers, married parents and higher caregiver education level. Previous studies indicate that a caring, stable family environment provides children with a better opportunity to develop and grow adequately [25, 26]. Therefore, living with both and/or married parents may contribute to a more stable family environment which in turn supports opportune child development ($p < 0.0.31$). Furthermore, living with both parents contributes to secure attachment between caregiver and child. Caregivers with higher education levels typically exhibit lower psychosocial risk profiles [50], putting their children at lower risk of developmental delays. Furthermore, these caregivers also tend to raise concerns earlier than caregivers with lower educational levels [51]. Yet, a study conducted in a middle-income country did not find a statistically significant relationship between developmental outcomes and caregiver education level [40]. The relationship between caregiver education level and developmental outcomes in children remains to be explored.

The influence of protective factors on early childhood development, as well its contribution to resilience, can inform practices and policies surrounding the preschool and larger community context. Protective factors can be integrated into the school curriculum and daily school activities to strengthen social and emotional skills. Furthermore, public health messaging and school-based stimulation programs can be developed and implemented to support ECD, but also to create awareness in communities on the role of the immediate home environment on developmental outcomes and, ultimately, future academic success.

A number of limitations were identified in the current study. The sample was relatively small and not representative of all low-income communities within South Africa. Future studies should also include families from various urban and rural communities. The use of an internationally standardized developmental assessment tool, the Vineland-3, presents another possible limitation, as questions may not always be contextually or linguistically appropriate. Despite these limitations, valuable findings were obtained that can aid future decision-making and community-based intervention processes.

Conclusion

Family relationships, education and resources have a significant impact on childhood development and its contribution to resilience in low-income communities. Even though children are exposed to various developmental risks, protective factors in vulnerable children can support and encourage age-appropriate childhood development. Important protective factors in low-income communities like caregiver education, living with both parents and parental marriage can inform public health messaging and other population-based interventions to support early childhood development within the family system.

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Ethics declarations

Conflict of interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from all participants and confidentiality was ensured.

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