

Neurodevelopment of Left-behind Children Under 3 Years Old in a Town in China

XJ ZHANG, Y ZHANG, H YANG, YJ ZHANG, LQ JIANG, SL LIU, Y BI, YX LIU, J CHEN, XP WEI, TY LI

Abstract

Objective: To investigate the neurodevelopment of left-behind children younger than 3 years old, a total of 289 children under 3 years old in a town in China enrolled in this study. **Methods:** We measure children's developmental quotients (DQs) in motor, adaptive, language, and social areas by the Gesell Developmental Schedules (GDS) for 0- to 3-year-old children. **Results:** For children under 3 years, It was found that comparisons of the mean scores showed that mean DQs were higher in control group but not significantly except adaptive area in this study. There was higher frequencies of developmental delay in all DQ areas in left-behind group compared to control group, with the difference was significant for delay in the adaptive, social areas and average. **Conclusion:** The findings suggest that, in a certain degree, non-parental care may affect the neurodevelopment of left-behind children under 3 years old living in the town. Effective measures should be taken to improve the life quality of left-behind children.

Key words

Growth and development; Left-behind children; Neurodevelopment

Children's Nutrition Research Center, Key Laboratory of Developmental Diseases in Childhood of Education Ministry, Children's Hospital of Chongqing Medical University, No. 136 Zhongshaner Road, Yuzhong District, Chongqing 400014, China

XJ ZHANG (張小娟) *PhD*
Y ZHANG (張贊) *PhD*
Y BI (畢楊) *PhD*
YX LIU (劉友學) *PhD*
J CHEN (陳潔) *PhD*
XP WEI (魏小平) *PhD*
TY LI (李廷玉) *PhD*

Department of Nursing, Chongqing Medical and Pharmaceutical College, No. 82 Mid University Road, Shapingba District, Chongqing 401331, China

XJ ZHANG (張小娟) *PhD*
H YANG (楊紅) *MD*
YJ ZHANG (張雲傑) *MD*
LQ JIANG (江領群) *MD*
SL LIU (劉善麗) *MD*

Correspondence to: Dr TY LI

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Introduction

Left-behind children in China often refers to the children who are living with one parent or extended family while the other parent(s) is/are absent from home, with the majority of left-behind children lived in rural areas. In fact, there is also high percentage of left-behind children in some towns of China, although residents in the towns of China registered as non farming population. China has been undergoing rapid urbanisation in the last few decades. By 2000, over 100 million people in China were migrants.¹ Until 2005, the number of floating populations in China had reached nearly 147 million.² Meanwhile, the number of left-behind children has also been increasing. When parents are unable to take care of their children, the responsibility falls to the grandparents.³ One study showed that in 2002, 59% of children in kinship care lived with grandparents, 19% lived with aunts and uncles, and 22% lived with other relatives in America.⁴

Recently, the number of studies on the education, mental health, behaviour, and personality of children left behind

has increased. Many studies suggested that left behind children are more likely to feel indifferent, introverted, inferior, and unsociable; more likely to have psychological problems, learning disabilities, and difficulties getting along with others; and even more likely to commit crimes.⁵⁻¹⁰ Study also found that left-behind children were risky to develop emotional/behaviour problems, particularly if they are left behind early in life.¹¹

However, Researches seldom focus on the left-behind children under 3 years old. Also, study about the neurodevelopment of left-behind children younger than 3 years of age in China has not been reported. The purpose of this study was to investigate the physical growth and neurodevelopment status of left-behind children younger than 3 years of age in a town in China, and analyse the differences between left-behind children and the children who live with parents at home.

Subjects and Methods

Study Subjects

In this study, left-behind children are defined as those whose parents or mothers had been working out of home for at least six months up to the interviewing day. All of the subjects were younger than 3 years of age and had been living in local areas for more than six months, regardless of household registration. The subjects are 289 children under 3 years lived in a town of Chongqing, China. Their demographic characteristics are presented in Table 1. Ethical committees from the Health Department of Chongqing approved the research protocol. All subjects gave informed written consent by completing a form approved by Chongqing University of Medical Sciences.

Personal Interview

A 45-min questionnaire was administered by a trained interviewer, through face-to-face interviews with the children's parents or guardians. The questionnaire elicited demographic information, lifetime residential history (location of birth and duration of residence) and family information related to education was also collected. Daily food care and special attending were both investigated to learn about the status of living care given by guardians. In this study, daily food care refers to food care for children coming from guardian everyday, such as arranging what to eat, how to eat, how many meals every day, etc. Special attending refers to nonmaterial cares, such as cares of neurodevelopment, behaviour, personality etc.

Measures Relevant to Birth Outcomes

Birth weight, birth length, and head circumference were measured immediately after parturition. Information abstracted by the research workers from mothers' and infants' medical records after delivery included date of delivery; gestational age at birth (based on the last menstrual period); infant sex, birth weight, length, head circumference, maternal height, prepregnancy weight, and total weight gain.

Measures of Child Neurodevelopment

Children were administered the version of the Gesell Developmental Schedules (GDS) for 0- to 3-year-old children, revised by the Beijing Mental Development Cooperative Group (1985) and adapted to the Chinese population. This version of the GDS accurately assesses development of children 4 weeks to 6 years of age.¹² The items are grouped into four main categories of functioning: motor behaviour; language behaviour; adaptive behaviour, and personal and social behaviour. Each child is assigned a developmental quotient (DQ) in each of the four specific domains: motor, adaptive, language, and social. A child with a DQ lower than 85 is considered to have a high probability of some organic impairment. Scores of 70-84 indicate moderate delay; scores of <70 indicate severe delay. A score of 84 is the cutoff point for determining normal and developmental delay. Testing was conducted by two trained physicians to maximise reliable assessment and valid interpretation. Testers completed a 1-year course at Shanghai Jiaotong University and passed standardised exams to become certified. Therefore, both interexaminer and intraexaminer variability were minimal. Further, the two examiners split the testing by domains, not by subjects. As a result, for any one domain, all subjects were tested by the same examiner.

Statistical Analysis

SPSS 11.0 for Windows was used to analyse the outcomes of the study. A Chi-square test was used for categorical variables and a t test was used for continuous variables. The value of p takes the probability of two sides, and α takes 0.05 as a test standard.

Results

A total of 310 questionnaires were returned, but only 289 were valid. Twenty-one questionnaires were rejected

because of absence of the left-behind children or control group. The sample showed good homogeneities in age, gender, birth weight, birth situation and maternal condition (age, height, education and head circumference) between the two groups (Table 1). The mean age of subjects was 2.06 years (SD=1.57, rang=1.8 to 2.2). Mean ages of the left-behind children and control group were 2.10 years (SD=1.0) and 1.96 years (SD=1.2), respectively, without significant difference. There were 150 boys (54.7%) and 139 girls (45.3%). The majority of children were full-term at birth (≥ 37 -week gestational age) and had normal birth weights ($\geq 2,500$ g). The mean birth weight, length and head circumference was 3.34 kg (SD=0.23), 50.3 cm (SD=1.4) and 33.7 cm (SD=1.6) in left-behind group, and 3.33 kg (SD=0.24), 50.9 cm and 33.5 cm in control group respectively, and the difference was not significant. There

was no obvious difference in maternal age, height, education and head circumference between the two groups.

Mothers of the control group were more likely to breastfeed their children but not significantly ($p > 0.05$), and the duration of breastfeeding in left-behind children was significantly shorter than with children in the control group ($p < 0.01$) (see Table 1).

Guardians of Left-behind Children

Our study shows that in the town, grandparents would be the first choice to care for the children when children must be removed from their parents' care. In this study, it was found that 90.8% of left-behind children were cared for by grandparents, 2.8% were attended by the father, 3.2% by an uncle and aunt, and 3.2% by friends or others.

Table 1 Comparison of Gesell scores in the two groups*

	Left-behind children (n=81) (percent)	Control group (n=208)(percent)	P-value
Maternal education			
<High school	39 (48.1)	90 (48.6)	0.511
\geq High school	42 (51.9)	118 (51.4)	
Maternal age (years)	25.56 \pm 3.22	26.19 \pm 2.91	0.091
Maternal height (cm)	157.8 \pm 5.1	158.8 \pm 6.3	0.122
Maternal head circumference (cm)	54.5 \pm 1.7	54.2 \pm 1.5	0.612
Gender			
Boy	45 (55.6)	105 (72.1)	0.512
Girl	36 (44.4)	103 (27.9)	
Birth weight (g)	3340.6 \pm 236.5	3334.6 \pm 241.5	0.451
Birth length (cm)	50.3 \pm 1.4	50.9 \pm 1.6	0.771
Birth head circumference (cm)	33.7 \pm 1.6	33.5 \pm 1.3	0.667
Gestational age (days)			
<37 weeks	2 (2.5)	3 (1.4)	0.62
\geq 37 weeks	79 (97.5)	205 (98.6)	
Feeding type			
Bottle feeding	19 (23.5)	34 (16.4)	0.177
Breastfeeding**	62 (76.5)	174 (83.6)	
Duration of breastfeeding (months)***	9.16 \pm 3.28	10.7 \pm 3.26	0.001

*Values are mean \pm SD or percent. The comparisons of continuous variables by Mann-Whitney test; binary variables by chi-square test; **Including breastfeeding and mixed feeding; ***Including breastfeeding and complementary food

Care of Left-behind Children and Children in the Control Group

As shown in Table 2, the situation of daily food care given by guardians in left-behind children (74.1% as full-time care, 24.7% as part-time care, and 1.2% as no care) was inferior to that of the control group (86% as full-time care, 13.5% as part-time care, and 1.9% as no care) ($p < 0.05$). The situation of special attending given by guardians in control group (86.5% as full-time attending, 12% as part-time attending, and 1.4% as no attending) was also superior to that of the left-behind group (72.8% as full-time attending, 24.7% as part-time attending, and 2.5% as no attending) ($p < 0.01$).

Neurodevelopment

To investigate the neurodevelopment of left-behind children, the distribution of DQs for both groups was compared. The mean score of motor area, language area, adaptive area, social area and average was 95.49 (SD=9.32), 100.41 (SD=11.78), 97.4 (SD=14.31), 99.25 (SD=97.60) and 97.6 (SD=10.8) in left-behind group. It was found that comparisons of the mean scores showed that mean DQs were higher in control group but not significantly except adaptive area ($p = 0.045$) in this study. There was higher frequencies of developmental delay in all DQ areas in left-behind group compared to control group, and the difference was significant for delay in the adaptive, social areas and average ($p = 0.027$, $p = 0.029$ and $p = 0.007$ respectively) (see Table 3).

Discussion

Left-behind children are a large and special population in the rural areas of China, particularly in poor areas, and their healthy development could benefit millions of families and contribute to the harmonious advancement of rural areas. With the increasing intensity in social structure transformation and the urbanisation process in China, more and more young adults are floating into cities, resulting in the problem of left-behind children. As a result, more attention should be paid to the status of care among left-behind children.

In our study, 90.8% of left-behind children lived with their grandparents, so the percentage of distant-generation upbringing is quite high. This number is consistent with reports by Duan and Liu, which show that 83.0% and 82.5% of left-behind children lived with their grandparents, respectively.^{1,8} It could be seen as a very common

phenomenon in China for left-behind children to be raised by grandparents while the parent(s) is/are absent from home. Studies have found that stable family circumstance helps to promote psychological development of children and adolescents.¹³ The differences in family role, education level, lifestyle between parents and other guardians may contribute to an unfavorable environment for psychological development for adolescent left-behind children (LBC).¹⁴ For example, in China many migrating parents leave their children with grandparents; research has indicated that they may either spoil the children or fail to give them enough emotional care.^{14,15} This may be due to grandparents being too old to have energy to give enough care to LBC or due to many grandparents receiving less formal education and taking a traditional "out-of-date" view on life, making it more difficult for LBC adolescents to adapt to a rapidly changing society and thereby contributing to the development of emotional problems.¹⁴⁻¹⁷

There are no studies about the influence of non-parent care on neurodevelopment of left-children under 3 years. Studies show that parental care in early life may impact an individual's developing brain and personality.^{18,19} Gunther et al report that children are at risk to have behaviour, motor developmental problems, and speech problems, with living in a one-parent family, having a divorced mother and/or unemployed father.²⁰ In this study, we investigated the status of intelligence of left-behind children by DQs. It was found that comparisons of the mean scores showed that mean DQs were higher in control group but not significantly except adaptive area in this study. There was higher frequencies of developmental delay in all DQ areas in left-behind group compared to control group, and the difference was significant for delay in the adaptive, social and average areas. It suggested that left-behind children are at risk to have neurodevelopment problems compared to their counterpart. Shorter breastfeeding duration in left-behind children may be one of the reasons, as we all know, studies have showed that the duration of breast feeding is positively related to young children's neurodevelopment.^{21,22} Absence of parental care may be another reason for neurodevelopment problems of left-behind children.^{18,19}

Our study shows that some left-behind children can get basic living care while their parent(s) is/are absent from home. But there still exists a certain gap between the two groups, that is, the conditions of daily food care and special attending in left-behind children were both inferior to that in the control group (Table 2). There are several possible reasons. Grandparents may not be able to look after the left-behind children wholeheartedly. What's more, the

mothers who left home for work were found to breastfeed their children less than the control group. In this study, the rate of breastfeeding of left-behind children (76.5%) was lower than in the control group (83.6%) though there was no significance, and the weaning age of left-behind children (9.16 months) was earlier than that in the control group (10.76 months). It was found that the rates of growth retardation and low body weight were both higher than that of the control group even though there was no significance.

Conclusion

This study demonstrates that it is necessary to improve the conditions of daily care and special caregivers of left-behind children under 3 years. Attention should also be paid to the neurodevelopment training of left-behind children younger than 3 years old. Knowledge about children neurodevelopment and related disabilities should be propagandised widely, which hopefully can enhance

Table 2 The percentage of living care given by guardians of left-behind children and children in the control group in a town in China

	Left-behind children (n=81) (percent)	Control group (n=208) (percent)	χ^2 value	P-value
Daily food care				
Full-time	60 (74.1)	178 (86)	7.825	0.020*
Part-time	20 (24.7)	28 (13.5)		
No	1 (1.2)	2 (0.9)		
Special attending				
Full-time	59 (72.8)	180 (86.5)	12.074	0.002**
Part-time	20 (24.7)	25 (12)		
No	2 (2.5)	3 (1.4)		

*p<0.05; **p<0.01

Table 3 Demographic characteristics of left-behind children and children in the control group in a town in China*

	Left-behind children (n=81) (percent)	Control group (n=208) (percent)	P-value
Motor area			
Mean (SD)	95.49 (9.32)	97.63 (9.05)	0.18
Developmental delay (N)	6 (7.4)	5 (2.4)	
Language area			
Mean (SD)	100.41 (11.78)	101.07 (10.14)	0.67
Developmental delay (N)	7 (8.6)	5 (2.4)	
Adaptive area			
Mean (SD)	97.4 (14.31)	100.03 (11.19)	0.045
Developmental delay (N)	8 (9.8)	6 (1.9)	
Social area			
Mean (SD)	99.25 (11.13)	100.82 (7.58)	0.25
Developmental delay (N)	6 (7.4)	4 (1.9)	
Average			
Mean (SD)	97.60 (10.8)	100.13 (7.5)	0.055
Developmental delay (N)	6 (7.4)	2 (0.9)	

*Comparisons of developmental quotients between groups by t-test, % delay by Fisher's exact test

SD=standard deviation

parents' understanding on the importance of good child care and early stimulation of children at home. The society and other extended family members should encourage the parents to stay home or work near home so that they can take care of their own children. In conclusion, great concern is needed from society, and effective measures should be taken to improve the quality of life of left-behind children.

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