The Prevalence of Developmental Delays among Infants and Young Children in Addis Ababa, Ethiopia

Moges Ayele

Abstract: *Several studies emphasized the importance of developmental and readiness testing as that would enable early identification of those who need support or further assessment. Besides, researches showed that children who were at risk or who experienced delayed development and who had been in early intervention acquired positive gains in development. In this connection, this study was conducted to screen for developmental delays among infants and young children in Addis Ababa. To achieve this objective, descriptive survey study was conducted. A sample of 1,062 infants and young children were randomly selected from Bole, Addis Ketema and Kolfe Keraniyo sub-cities. Infants and young children's development was assessed using Ages and Stages Questionnaire – Amharic version. Besides, the characteristics of home environment, maternal and child conditions were gathered with the questionnaire set for this purpose. The data collected were analyzed through frequencies and percentages. The results of the investigation revealed that 28.13% of infants and young children involved in this research revealed global developmental delay and more delayed development was observed in fine motor domain as 30.53% of children showed delayed development in this domain, which was followed by personal social domain (21.15%) and problem solving domain (18.28%). Possible reasons for these delays are discussed.*

Introduction

Several noted professionals of the past and with concern on child welfare and development have shown interest in early infant and child testing and screening. Most of these were psychologists and pediatricians and in most of the references Alfred Binet's work was frequently cited. Binet developed an intelligence test that allowed practitioners to identify children who could not benefit from regular educational programs and who demanded additional support. Similarly, Bayley (2006) developed Bayley Scale which was used by pediatricians to assess developmental delays and plan for intervention strategies.

Even in recent years several writers stressed the importance of developmental and readiness testing as that would enable early identification of those who need support or further assessment (Drummond, 2004; Branson, Vigil & Bingham, et al., 2008; Rydz et al., 2006). Some of these writers particularly pointed that screening should

be conducted as early as possible as the early years are crucial for optimal brain development. However, others showed their concern over having accurate and efficient developmental screening tests that are vital for early identification of developmental problems (Heo, Squires, & Yoyanoff, 2008; Nsamenang, 2009).

Nevertheless, in countries where adequate studies were conducted, it was observed that a significant number of children had problems related to development, emotion or learning. For example, in the USA it was reported that one in five children had a developmental, learning or emotional problems (Drummond, 2004). Rydz and colleagues (2006) estimated this figure to be between 12% and 16%. In another related study, it was shown that 14% of all Netherlands children manifested developmental difficulty of some kind (Scholte, Van Berckelaer-Onnes, Van der Ploeg, & Van den Bergh, 2008). Furthermore, a study conducted in Taiwan revealed a slight increase (by 7.7%) in a number of children with developmental delays from year 2003 to 2007(Lin, Yen, Wu, & Kang, 2009). Similarly, Hannus, Kauppila, and Launonen (2009) documented an increase (from 0.04% to 0.69%) in the prevalence of delayed language development in Finland.

As far as the state of developmental delays in Africa is concerned, though data are lacking for the continent at large, the existing data for some countries depict that a considerable number of children is affected by various forms of delayed development. For example, one research assessed the developmental status of Rwandan children on various developmental domains such as gross and fine motor development, acquiring language and social skills. Children involved were those infected by HIV and the uninfected ones. From the infected group 12.5%, 16%, 20%, and 9% showed delayed development at 6, 12, 18 and 24 months respectively (Msellati et al., 1993). These prevalence rates are even lower when compared to what was shown in the Republic of South Africa where 72% and 52% of HIV infected children showed motor delay and cognitive delay respectively (Potterton et al., 2009). However, information on this problem is rare not only in Africa but also in the whole developing world. In this regard Durkin (2002) pointed that though large numbers of children who live in the developing countries are exposed to various forms of developmental challenges not much is known about the prevalence and causes of the challenges in these countries of the world. Ethiopia as one of the countries located in Africa is not an exception concerning the data on the issue of developmental delays. The researcher could not find any study that addressed the prevalence of developmental delays among the children of the country. Some of the studies conducted in the country addressed issues related

to disability and psychiatric disorders such as epidemiology of child psychiatric disorders in Addis Ababa (Desta, 2008), baseline survey on disabilities in Ethiopia (Tirussew, Savolaninen, Agedew, & Daniel, 1995),disability in Ethiopia (Tirussew, 2005) and disability and development (Seleshi, 2010). These studies are remotely related to the present study and the prevalence rates reported by these studies range from 1.9% to 17%.

Since considerable number of children experience developmental delays assessing delayed development appears to be very important anywhere in the world and here in Ethiopia. Some investigations of screening for developmental delays were initiated due to parents' concern on their children's level of progress in mastering the developmental milestones. For instance a study by Eddey (1995) was initiated due to parents' concern and data confirmed parents' perception of their children's level of development. In other instances, in some developed countries there is "child-find program" in which case professionals conduct developmental surveillance and screening during well-child visits. A research on this "child-find program" revealed that the program was effective in identifying children eligible for early intervention (Shannon & Anderson, 2008).

As mentioned the basic aim in conducting developmental surveillance and screening is to identify children who are at risk and who would benefit from early intervention to tackle the negative effects of developmental delay and other developmental disabilities. In some countries like India it was found that people's awareness about developmental delay and early intervention was low (Kaur et al., 2006). Yet it was well established through randomized and controlled investigations that children with developmental delay or who were at risk for developmental delay, and who passed through early intervention programs showed both short-term and long-term gains compared to their control counterparts in the areas of intellectual development, school or educational achievement and on economic matters or in economical self-support later in life (Ramey and Ramey, 1999). Some writers strongly argued that about 200 million children worldwide fail to reach their developmental potential (in the developing world especially in South Asia and Sub Saharan Africa) because they are not in a position to get the services that enable them to overcome developmental delay and other disabilities that hinder their optimal development (Grantham-McGregor, et al. 2007). It appears that this is a huge loss and wastage and countries in these parts of the world should give due attention to their children especially in assessing their developmental progress and to institute appropriate services when needed.

In line with this in recent years, the government of Ethiopia gave due emphasis to promote health care services through Health Extension Programs in the country by training and deploying health extension workers throughout the country (Federal Ministry of Health, 2007). One area of training health extension workers received was family health which focuses mainly on mother and child health. This coupled with the other recent initiative taken by the government of Ethiopia to strengthen early childhood care and education would offer an opportunity to integrate developmental screening and testing to the programs being implemented. As there is a strong association between the understanding one has about the developmental status of children and provision of appropriate care to children, linking the two will contribute a lot for the nation's development. It is noted that recently three Federal Ministries, i.e. Ministry of Education, Ministry of Health and Ministry of Women Affairs came together to launch an integrated national Early Childhood Care and Education Policy and Strategic Framework. The policy focuses on four areas including: parental education, health and early stimulation programs, pre-school community-based kindergarten, and community based non-formal school readiness programs (Ministry of Education, 2010). As mentioned developmental assessment can be integrated with these programs and children with delayed development can be identified and offered interventions as we see in other countries. This seems a huge initiative but can be started at some point for the betterment of the children of the country. But for that we need to know how far the problem of delayed development is prevailing in the country. Since we do not have any study on this matter we do not know the status of developmental delay in this country. This study is a humble effort to fill this knowledge gap by taking Addis Ababa as a research site.

Thus, the present study has aimed at screening infants and young children of Addis Ababa to find out their level of progress in mastering developmental milestones. The screening involved assessing their attainment in communication, gross motor, fine motor, problem solving, personal social domains and overall development. By doing so this study aimed to determine the prevalence of delayed development (where infants and children score on ASQ – Amharic version is below 2 standard deviation points from the mean) in five developmental domains such as communication, gross motor, fine motor, problem solving and personal social domains. At the same time the prevalence of global developmental delay also was aimed to be determined in which case delays in two or more areas are experienced by infants and children.

Methods

The research design of this study was descriptive survey design. It was used to determine the prevalence of developmental delays among infants and young children. The study was conducted in Addis Ababa.

Research Participants

Participants of this research were infants and young children and their parents or caregivers. Specifically those infants and children from age of 9 months to 4 years took part in this study. Samples were drawn from the Addis Ababa city through multi-stage sampling. From the ten sub-cities three sub-cities were selected after consulting with the city administration on socio-economic variation among the sub-cities. To this end the researcher has visited the Ethiopian Customs and Revenue office, which is responsible for collecting revenues from the Country including Addis Ababa City Administration. From the data obtained from this office the sub-cities that bring the highest amount of revenue often were found to be Bole, Kirkos and Nefas Silk Lafto; those that bring medium level income were Arada, Addis Ketema and Lideta; and the sub-cities often with low revenue were Kolfe, Yeka, Akaki and Gulele. After having these three categories, from these three groups three sub-cities were selected randomly using lottery method. From the highest revenue category Bole was selected, from the medium group Addis Ketema was selected and from the low group Kolfe-Keraniyo was selected.

These sub-cities have different number of districts (woredas as known locally). In connection with this, Bole has 14 districts, Addis Ketema has 10 and Kolfe has 15 districts. As the number of districts vary as shown, from Bole and Kolfe sub-cities three districts from each were selected randomly using lottery method and from Addis Ketema 2 districts were selected. In each district there are Ketenas that comprised 500 households and assigned to one extension health worker. In this line ten Ketenas from each of Bole and Kolfe sub-cities and six Ketenas from the districts of Addis Ketema were selected randomly.

To select samples of infants and young children from the selected Ketenas in the first place sample size was determined. To determine the sample size the following formula was used.

$$\mathbf{n} = \frac{\mathbf{t^2 \times p(1-p)}}{\mathbf{m^2}}$$

Where:

n = required sample size

t = confidence level at 95% (standard value of 1.96)

p = estimated prevalence of developmental delay in the study area

m = margin of error at 5% (standard value of 0.05)

To determine the prevalence rate the researcher thoroughly went through the literatures on prevalence rate of developmental delay in different parts of the world, especially in the developing world. For instance, in Columbia the prevalence rate of delayed development was 10.8% (van Meerbeke, Talero-Gutierrez & Gonzalez-Reyes, 2007). The research on children adopted from Ethiopia to Belgium showed the prevalence of 12% of developmental delay (Meeus, Peeters, Ramet, Van Gompel&Wojciechowski, 2010). By taking all these into account and by taking WHO's suggestion of 10% the researcher decided to use the prevalence estimate of 10% to determine the sample size. By using all the values shown above and the prevalence estimate of 10% it gives 138. Hence, 138 infants and young children were taken from one age category and as there are 7 age categories 966 infants and young children were taken from all seven age categories. Furthermore, by expecting 10% non-response rate additional 96 infants and young children were added to the sample, which adds to 1062. To proportionally allocate the number of children to be taken from the three sub-cities the researcher considered the size of infants and young children in the three sub-cities selected. The number of children below age five was taken from the health offices of the sub-cities. In this regard in Kolfe sub-city the figure obtained was 34,243, in Bole and Addis Ketema the figures were 24,524 and 20,797 respectively. Considering these figures the samples were taken from Kolfe, Bole and Addis Ketema sub-cities i.e., 457, 328 and 277 samples were taken respectively from the three sub-cities, which add up to 1062. These samples were assessed to see how well the infants and young children were progressing through the developmental course.

Data Gathering Tool

As far as data collection instrument is concerned among researchers there was an on-going dialogue regarding whether screening tools could be filled in by parents or professionals should complete the screening tools. One research in this area revealed that parent completed questionnaires can be used in identifying children with developmental delays accurately (Rydz, 2006). However, in another study that compared the agreement between parents and teachers on childhood disability it was seen that teachers rated the children's level of functioning more severely than parents (Shin, et al., 2008). On the related issue, an African writer emphasized that though professionals on developmental assessment do not take information from significant others such as parents and siblings this

practice may lead to failure to detect a child with developmental delay as parents are the ones who first observe and recognize whether their child is developing well or lagging behind from his or her age mates (Nsamenang, 2009). Though the debate as who would complete development testing tool seems not settled this study used the tool that is completed by parents.

This instrument that was used in this research was the Ages and Stages Questionnaire - the third edition. As mentioned it is one of the instruments that parents or guardians complete after trying the activities in the questionnaire with their child. In other words in the questionnaire there are different tasks (For example, some of the items ask: Does your child say the following three words: "mama", "dada", and "baba"? Does your child hold and pick up a piece of bread or biscuit with the thumb and other fingers? If you show your child, Does the child bring a doll or other toy that is a bit far using a spoon or something else? Does your child drink from a cup or a glass; puts it without spilling much? While your child is holding a chair or table with one hand, Does he pick up a doll or something from the floor and return to the position where he was standing?) that infants or children are expected to do depending on their age level and parents ask their children to perform these tasks and then respond to questions in the questionnaire. The development of this instrument started in late 1970s and 1980s in the United States of America. The authors were inspired by observing a study that involved parents to evaluate their children's developmental status and comparing parental evaluation with professionals' evaluation of the children's developmental status. To the authors surprise parental evaluation was consistent with the professionals' evaluation of children's developmental status. Initially the name given for the instrument was Infant/Child Monitoring Questionnaires. After thorough revision and modification of the items in the questionnaire the instrument got its current name the Ages and Stages Questionnaire in its 1995 publication. Since then it was revised twice and the second edition appeared in 1999 and the current third edition appeared in 2009 (Squires, Twombly, Bricker & Potter, 2009).

ASQ-3 consists of 21 separate questionnaires designed for 21 age intervals from 1 month to 66 months. From these 21 questionnaires the researcher used 7 questionnaires. These are questionnaires for 9, 12, 18, 24, 30, 36 and 48 months age intervals. These age intervals were selected by the researcher based on the recommendation made by American Academy of Pediatrics and other writers (Council on Children with Disabilities, 2006; Tsai, McClelland, Pratt & Squires, 2006)). According to this group 9 month is a time when an infant shows development that can be reliably detected in

various developmental domains such as motor development. Besides, signals of the development of early communication skills appear during this age. In addition to what have been mentioned early markers of autism such as failure to make eye contact, not responding to name being called or pointing to objects may be seen during this period. The 12 month questionnaire was selected because according to AAP if children are not tested during 9 months of age rather than waiting for the 18th month it is recommended if they are tested during their 12 months of age. The document by AAP made it clear that during 18 months of age one would accurately determine if children have delayed development in communication and language. Moreover, delayed motor development that was not detected in previous periods can be detected during this time. The 24 month questionnaire was selected for reason similar to that of the 12 month questionnaire. Concerning the 30 months questionnaire selection AAP indicated that by this age professionals can detect delays in development in various domains such as language, cognitive and motor domains. 36 and 48 months are the times when children are in kindergartens and during these times it is appropriate to assess children's development to detect problems that may hamper their readiness for schooling.

Before using the questionnaires to collect data on children's developmental status in

Addis Ababa attempt was made to adapt the questionnaires to the Ethiopian context. The first step in this regard was translating the questionnaires into Amharic with the help of a language expert. After the questionnaires were translated into Amharic another language expert made back translation of the questionnaires into English. Later on both translators and the researcher came together to see the consistency of the translations in transmitting the same message in both languages. The second step was collecting opinions and ideas from a team of experts and parents regarding items in the questionnaire. In this connection, one specialist in pediatrics, three psychologists, one special needs educator and one nurse were consulted on the appropriateness of the items to the Ethiopian context. Except minor amendments in some words of the translated version all those involved in evaluating the items shared their opinion that items are appropriate for the Ethiopian children. However, one of the psychologists actually pointed whether problem solving items measure the ability to solve problems. Besides, the pediatrician showed his concern whether parents could accurately fill in some of the items. Yet the opinion of special needs educator was that parents can actually fill in the items easily as the

items are not as such complicated and do not demand complex skills from parents.

Since its advent to public domain ASQ has been used in developmental screening in several countries. It is widely used in the US. Besides, developmental monitoring programs in other countries such as China, Southeast Asia, Australia, Africa, India, Europe, and Central and South America use ASQ in their projects.

The special feature of ASQ system is its ease of administration and the low cost it incurs for service providers. Moreover, to determine its psychometric quality the data were collected from more than 18, 000 children. Above all, it has shown very strong psychometric qualities such as high reliability and validity. The test-retest reliability and the inter-observer reliability indices were both high and the index for both was 0.96. It has also moderate to strong internal consistency as evidenced by the Cronbach alpha ranging from 0.60 to 0.85. Evidence for validity was obtained from several sources such as comparing the mean score for children with risk and non-risk. It is generally observed that children at risk had lower mean compared to children with no risk. The other evidence for validity was obtained by comparing the scores of ASQ with other scores on standardized measures. In this regard ASQ was compared with Battelle Development Inventory (BDI). The percent of agreement between the two measures in identifying children with developmental delays ranged from 82.6% to 88. 3%. Besides, showing these qualities ASQ has shown strong sensitivity (82.5-89.2%) and specificity (77.9-92.1%) (Squires, et al. 2009).

There are research evidences that support the possibility of using the norm established elsewhere in screening developmental delays in other cultures given adequate adaptation and validation studies are made. For instance a research was carried out in Korea by involving 3220 parents of young children with age ranges from 4 months to 5 years. Researchers performed different analyses such as validity, reliability and whether items functioned differently for US and Korean population. The evidence showed high validity and reliability and the items functioned largely similarly for Korean and US population. The most important finding was that the mean scores for Korean ASQ were generally similar to the US samples. Based on their observations the authors concluded that Korean ASQ was found to be valid and reliable parent completed screening instrument that can be used for developmental screening of Korean children (Hoe, Squires, &Yovanoff, 2008). Similarly, the research by Tsai, McClelland, Pratt, and Squires (2006) showed that ASQ used for Taiwanese children was found to be culturally appropriate to test Taiwanese children.

Pilot study was conducted on 69 children in age ranges that took part in the main study. In this regard infants from 9, 12, 18 and 24 months as well as young children from 30, 36 and 48 month intervals were involved in the pilot study. Health extension workers and counseling psychology graduate students participated in collecting data for the pilot study. The pilot study was conducted mainly to see the reliability of the data collection instrument ASQ – Amharic version. Reliability of the scores obtained using ASQ was determined using Cronbach alpha. The internal consistency of the instrument was found to be 0.74, which is in the acceptable range. Besides, Pearson Product Moment correlation was computed to see how scores in each domain correlate with scores in other domains and with the overall score. And it was found that all correlation coefficients computed between each developmental domain and the overall score were significant at 0.01 alpha level indicating the consistency of scores on these developmental domains and the overall score. Besides, the scores in almost all of the domains were associated significantly with one another, which show congruence of the scores in these different domains.

Data Collection Procedure and Data Analysis

Before collecting data using the instrument described above training was given to Health Extension workers working in the sites sampled for data gathering. They obtained the training as how to administer questionnaire for mothers or caregivers on house to house level. First of all they located the households where infants and young children of the required age can be found and then they selected the required sample size randomly by using the lottery method. Participation on the study was on voluntary basis and all ethical issues were observed including obtaining written informed consent from the participants.

Data that were collected using the ASQ Amharic version, and demographic and background characteristics questionnaire were analyzed using different statistical techniques. The prevalence of developmental delays was determined by having proportions of children who performed below 2 standard deviation points from the mean for the age group in each developmental domains assessed in the investigation. In this regard, prevalence was determined for separate developmental domains and for global functioning as well. To do all these statistical analyses SPSS for windows version 20 was used.

Results

As it was shown in the methods section 1062 infants and young children were sampled from the three sub-cities of Addis Ababa. Mothers/care givers of these children with the help of health extension workers completed the Amharic ASQ. 47 questionnaires were not fully complete and were discarded while the remaining returned

questionnaires were complete. In other words, 1015 questionnaires were complete (which makes the response rate 95.6%) and were used in data analysis.

The Prevalence of Developmental Delays in each Age Interval

Infants and young children from seven age intervals were involved in this study. Infants and young children whose scores were situated at or below 2 standard deviation points from the mean were considered as developmentally delayed and these figures are shown for the different age intervals

9 months old infants

Table 1: *9 Month Old Infants whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 SD points N=123	Proportion
Communication	38.55	12.29	18	14.63%
Gross motor	46.72	14.45	22	17.89%
Fine motor	52.31	10.49	33	26.83%
Problem solving	49.51	10.39	24	19.51%
Personal social	42.47	11.78	15	12.20%
Delays in two or more areas			30	24.39%

Infants in this age interval were those within the age range of 9 months and one day to 9 months and thirty days. Their development was assessed by ASQ and the findings showed that delay in fine motor skill was more prevalent in this age interval (26.83%) followed by delay in problem solving skills (19.51%) and delay in gross motor skills (17.89%). Delay in two or more areas of development often referred to as global developmental delay was observed in 30 of the infants, which gives the prevalence rate of 24.39%. Delays in communication skills and personal social skills were less prevalent in this age interval as it is presented in the above table.

Infants in 12 Months Interval

Table 2: *Infants in 12 Months interval whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 s points N=151	Proportion
Communication	43.22	13.79	8	5.30%
Gross motor	49.92	14.22	22	14.57%
Fine motor	52.22	8.86	67	44. 37%
Problem solving	48.99	10.84	38	25.17%
Personal social	45.73	12.00	37	24.50%
Delays in two or more areas			57	37.75%

Infants in this interval were infants in the age range of eleven months and one day to twelve months and thirty days. The above table shows the developmental status of infants in this age interval. As one may see from the table, delay in fine motor skills (44. 37%) was more prevalent in this age interval too followed by delays in problem solving skills (25.17%) and personal social skills (24.50%). Delays in gross motor skills and communication were less prevalent. Global developmental delay was seen in 37.75% of the infants who were involved in this survey.

Infants in 18 Months Interval

Table 3: *Infants in 18 Months Interval whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 s points N=154	Proportion
Communication	42.30	14.62	9	5.84%
Gross motor	55.46	9.04	23	14.94%
Fine motor	52.44	9.06	58	37.66%
Problem solving	45.99	10.13	49	31.82%
Personal social	47.90	10.35	7	4.55%
Delays in two or more areas			55	35.71%

Infants within the age interval of 17 months and one day to 18 months and thirty days were involved in this age segment. As it was the case with the other two age groups shown above, in this age segment also more delay was observed in the domain of fine motor skills (37.66%), which was followed by problem solving skills (31.82%). Delays were less prevalent in the areas of gross motor skills, communication and personal social skills. Concerning global developmental delay, the prevalence rate for this age segment was 35.71%.

Young children in 24 Months Interval

Table 4: *Infants in 24 Months Interval whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 s points N=154	Proportion
Communication	51.23	13.03	10	6.49%
Gross motor	54.73	8.33	27	17.53%
Fine motor	51.70	8.27	60	38.96%
Problem solving	49.40	9.81	26	16.88%
Personal social	51.14	9.80	54	35.53%
Delays in two or more areas			61	39.61%

Young children within the age range of 23 months and one day to 25 months and fifteen days were involved in this age interval. The pattern for this age interval was also similar to other intervals and delay in fine motor skills was more prevalent followed by delay in personal social skills. Delay in communication skills was found to be less prevalent and this was mostly true for the other age intervals as well. 61 children exhibited delay in two or more areas that gives the prevalence rate of 39.61%.

Young children in 30 Months Interval

Table 5: *Young children in 30 Months Interval whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 s points N=123	Proportion
Communication	53.81	10.25	11	7.19%
Gross motor	53.54	8.70	19	12.42%
Fine motor	46.78	13.76	41	26.97%
Problem solving	50.18	11.55	8	5.26%
Personal social	51.87	9.93	33	21.71%
Delays in two or more areas			28	18.30%

In this age interval we had young children in the age range of 28 months and sixteen days to 31 months and fifteen days. Consistent with other age intervals, delay in fine motor skills was more prevalent (26.97%), which was followed by delay in personal social skills (21.71%). Delay in gross motor skills comes next and it was followed by communication and problem solving skills. The prevalence rate of global developmental delay for this age segment was 18.30%.

Young children in 36 Months Interval

Table 6: *Young children in 36 Months Interval whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 s points N=152	Proportion
Communication	51.88	10.44	11	7.24%
Gross motor	54.68	8.84	20	13.16%
Fine motor	47.07	14.50	43	28.29%
Problem solving	51.97	10.84	24	15.79%
Personal social	52.82	8.74	61	40.13%
Delays in two or more areas			44	28.95%

In this age interval that involved children between 34 months and 16 days and 38 months and 30 days, delay in personal social skills was more prevalent (40.13%) followed by delay in fine motor skills (28.29%). The prevalence rate for delays in problem solving skills, gross motor skills and communication were found to be 15.79%, 13.16% and 7.24% respectively. 44 (28.95%) children from this age interval showed delay in two or more areas of development.

Young children in 48 Months Interval

Table 7: *Young children in 48 Months Interval whose Scores were at or below 2 Standard Deviation Points*

Areas of Development	Mean Score	Standard Deviation	Children Scored at or below 2 s points N=158	Proportion
Communication	52.92	11.10	5	3.16%
Gross motor	52.71	9.97	17	10.76%
Fine motor	45.35	14.77	17	10.76%
Problem solving	52.78	10.74	22	13.92%
Personal social	50.34	11.87	14	8.86%
Delays in two or more areas			16	10.13%

Children within the age range of 45 months and one day to 50 months and thirty days were involved in this age interval. As it is shown in the above table, relatively delay in problem solving skills was more prevalent (13.92%) followed by delay in fine and gross motor skills (10.76 % each). The prevalence rate is lower for personal social skills (8.86%) and communication (3.16%). Global developmental delay was exhibited by 10.13% of the children.

Delayed Development in the Overall Age Intervals

In the above tables the prevalence of developmental delays in five developmental domains was presented for different age intervals that were involved in this research. In order to get the overall impression about in which domains of development more delays were exhibited the researcher made an attempt to pool the number of children with delayed development from all age intervals with respect to the developmental

domains. The results are presented by bar graph here under.

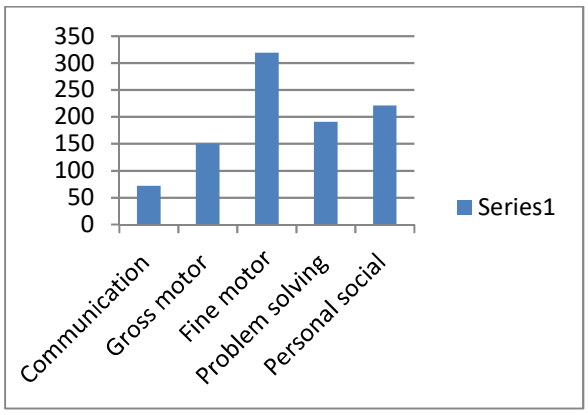

Fig 1: Developmental delays in five domains among infants and young children of Addis Ababa (N=1015)

From the above graph one may see that more delayed development was observed in fine motor skills domain in which 319 (30.53%) children manifested delayed development, which was followed by delayed development in personal social skills domain. In this domain 221 (21.15%) children exhibited delayed development. Besides, 191 (18.28%) children showed delayed development in problem solving skills domain, 150 (14.35%) children manifested delayed development in gross motor skills domain and 72 (6.89%) children showed delayed development in communication domain.

In addition to considering developmental delays in specific domains for all age categories involved in this study an attempt was made to determine the number of children who exhibited delayed development in two or more domains of development. These numbers were presented in each table depicting developmental delay for each age category. Taking the numbers from all the tables shown, it gives 294 infants and young children. These 294 infants and young children manifested delayed development in two or more areas, which gives the prevalence rate of 28.13%. In other words 28.13% of infants and young children who took part in this study were found to have global developmental delay.

In order to see global developmental delay in each age category with respect to the sexes the researcher has put the findings in the following table.

Table 8: *Global Developmental Delay with Respect to the Sexes*

Age Category	Gender	With GDD*		Without GDD	
		N	%	N	%
9 Months	Male	19	30.16	44	69.84
	Female	11	18.33	49	81.67
12 Months	Male	28	38.89	44	61.11
	Female	29	36.71	50	63.29
18 Months	Male	29	32.95	59	67.05
	Female	26	39.39	40	60.61
24 Months	Male	38	45.24	46	54.76
	Female	23	32.86	47	67.14
30 Months	Male	16	21.33	59	78.67
	Female	12	15.38	66	84.62
36 Months	Male	22	31.43	48	68.57
	Female	22	26.83	60	73.17
48 Months	Male	9	11.25	71	88.75
	Female	7	8.97	71	91.03

Note: * GDD stands for global developmental delay

In the above table it is shown that the proportion of male infants and young children with global developmental delay was higher compared to female infants and young children in all agecategories except one age category. This exception was the proportion of females in the age category of 18 months which was a bit higher from the proportion of males.

Discussion

As it was presented in the results section, screening for developmental delays is carried out with infants and young children in different age intervals. In this line the screening is done with infants at 9, 12, 18 and 24 months of age and with young children at 30, 36 and 48 months age intervals. Theses age intervals are considered depending on what has been done in other parts of the world. For instance the American Academy of Pediatrics authorizes administering developmental screening tests in 9th, 18th and 30th month home visits (Council on Children with Disabilities, 2006). Also in parts of United States developmental screening has been carried out at 6, 12, 18, 24 months 3, 4 and 5 years of age (Earls & Hay, 2006). In some European countries, developmental screening is carried out monthly in the first year of life or three or four times a year in the first year of life and in subsequent years in some cases twice in the second year of life otherwise once and in the remaining years once a year until children start schooling (Drillien & Drummond, 1983). Though the age ranges selected by the researcher do not perfectly fit the

suggestions made by different authors attempt has been made to consider important age ranges indicated in the literature. The researcher believes that those important age ranges were all encompassed in this research.

In this screening process the researcher comes up with developmentally delayed children in developmental domains of communication, gross and fine motor skills, problem solving and personal social skills. Some children are seen to have developmental delays in two or more areas of development. As it is depicted in the results section, the large number of delays is observed in fine motor domain. In this regard 26.83%, 44.37%, 37.66%, 38.96%, 26.97%, 28.29%, and 10.76% of infants and young children from 9, 12, 18, 24, 30, 36, and 48 months age intervals respectively showed delay in fine motor development. For most age intervals, the prevalence rate of delayed development in fine motor is by far very higher compared to what has been observed in other studies. For instance the study conducted in Colombia revealed that 10.3% of the children showed delayed development in fine motor skills. May be it is possible to say that fine motor delay in 48 months age interval is somehow closer to what has been seen in Colombia (van Meerbeke, Talero-Gutierrez, & Gonzalez-Reyes, 2007). What is observed for most of the age groups can be comparable with the research conducted on adopted children from several countries. From these international adoptees 40% exhibited delayed development in fine motor domain (Miller, Kiernan,Mathers, &Klein-Gitelman, 1995). One possible reason why many infants and young children showed developmental lag in this domain may be parents or care givers do not allow children to touch or manipulate different objects in their environment for fear that the objects may harm their children. For instance in one case though the question in the questionnaire was not open ended but it asks whether the child puts on/off switches and the respondent answered by marking on the column of Not Yet; and she indicated that she would not allow her child to do that. This is only one encounter and from this and from his personal experience this researcher puts forward the above reason as one possible explanation as to why most children showed delayed development in this domain. The other possible reason may be lack of playing materials in the home environment of most children where they can play and manipulate objects that would obviously hinder them from acquiring fine motor skills.

The reader may have noticed from what has been presented in the results section that considerable number of children exhibited delayed development in personal social domain too.

In this connection, 12.20%, 24.50%, 4.55%, 35.53%, 21.71%, 40.13%, and 8.86% of infants

and young children from 9, 12, 18, 24, 30, 36 and 48 months age intervals respectively showed delayed development in personal social domain. When the researcher compares the proportions for these different age categories with the study conducted in Colombia the prevalence rate here is too high for most of the age groups. In Colombian study 9.8% of children involved in the study manifested delayed development in personal social domain. As one may see from the above proportions most of them are considerably greater than that of the Colombian proportion. On the other hand the proportions for children of 18 and 48 months were a bit lower for the current sample than that of the Colombian's (van Meerbeke, Talero-Gutierrez, & Gonzalez-Reyes, 2007). We may ask ourselves as to why large number of children showed delayed development in this domain. Most of the items incorporated in this domain ask about self-help skills. As it is indicated above in fine motor domain, regarding this domain also it is possible to assume that parents or care givers do the tasks for the children. For instance parents or care givers may feed and dress the child even when the child is able to do these activities by her or himself. In instances of this kind it is no wonder if most infants and young children show delayed development in personal social domain.

The other area of development in which we have substantial number of infants and children showing delayed development is in problem solving domain. In this domain 19.51%, 25.17%, 31.82%, 16.88%, 5.26%, 15.79%, and 13.92% of infants and young children from 9, 12, 18, 24, 30, 36 and 48 months age intervals respectively showed delayed development. As it is legitimate to think of this domain consistent with cognitive development, the research mentioned above (on international adoptees) reported that 16% of the adoptees were found to be delayed in their cognitive development (Miller, Kiernan,Mathers, & Klein-Gitelman, 1995). With some exceptions, the findings for the age intervals indicated are comparable with the finding of Miller et al. However, for the age categories such as 9, 12, and 18 months the proportions are higher than that of the adoptees and for the age groups such as 30 and 48 months the proportions for the current samples are lower. For the remaining two age intervals it appears that the proportions are approximately comparable. As it is indicated above for some age groups the proportions are higher and the reader may ask why this is so. One possible reason may be the reason which is given to the fine motor domain above. This is to say that if the households are not adequately stimulating and not equipped play materials, infnats and children are then more likely to be hindered in these domains development and problem solving abilities. Besides, whether parents or care givers

guide their children in acquiring these skills or not would matter a lot. This is another possible reason for having such delayed development in this domain.

In the above paragraphs developmental delays in three of the domains are discussed. Compared to these three domains delays in gross motor and communication domains are lower in the samples of the current study. From infants and young children screened at 9, 12, 18, 24, 30, 36 and 48 months age intervals 17.89%, 14.57%, 14.94%, 17.53%, 12.42%, 13.16% and 10.76% respectively showed delayed development in the gross motor domain. However, when we compare these proportions with that of the Colombian still the proportions for most of the groups are higher though not very much higher as it is the case for the other domains. In the Colombian study the prevalence rate reported was 9.3% for this domain (van Meerbeke, Talero-Gutierrez, & Gonzalez-Reyes, 2007). But when we compare this rate to ours especially for the first four age intervals what we have found here is still higher and for the remaining three age intervals though higher than the Colombian finding but closer to it. However, delay in this domain is comparatively lower when it is compared to what has been reported on international adoptees. The rate of gross motor delay for the adoptees group was 33% (Miller, Kiernan,Mathers, &Klein-Gitelman, 1995). From what has been reported above, we see that delayed development in this domain is less prevalent. But it is still higher than others in certain instances. The possible reason for this may be the same as that indicated for the fine motor delay case. That is if parents do not let their children move around, climb, run and so on and if infants and young children are confined to one area, their development would be stifled. This may be the reason why we see delayed development to the extent shown here.

As far as delay in communication domain is concerned 14.63%, 5.3%, 5.84%, 6.49%, 7.19%, 7.24% and 3.16% of infants and young children from 9, 12, 18, 24, 30, 36 and 48 months age intervals respectively exhibited delayed development. From what we observed in Colombian group we see all the proportions of our infants and young children are lower than what has been reported for the Colombian children. For the Colombian group, delay in this domain was reported to be 18.6% (van Meerbeke, Talero-Gutierrez, & Gonzalez-Reyes, 2007). The finding of the present study was also lower when compared to the research that was conducted on international adoptees, which was 18% (Miller, Kiernan,Mathers, &Klein-Gitelman, 1995) that is similar to what has been found among Colombian preschoolers. From what we observe here, it seems that delay in communication domain is less prevalent among

infants and young children of the study area. One may suspect that parents or care givers and members of the family may communicate to the child in adequate manner and may have encouraged both receptive and expressive language in their children, which may have contributed to the lower number of delays in this domain. From the personal experience of the researcher, mothers in some cases may carry their children at their back and while the child is there they often talk to him or her and this may stimulate language development in children. May be this can be considered as a potential reason as to why we have observed low prevalence of delays in communication domain.

As it is indicated above, the rate of infants and young children who exhibited delay in two or more areas are identified in this study. Their number and proportions were shown in the results section. In this regard from 9, 12, 18, 24, 30, 36 and 48 months age intervals 24.39%, 37.75%, 35.71%, 39.61%, 18.30%, 28.95% and 10.13% respectively showed delayed development in two or more areas of development. When the researcher took the whole group and determined the rate of global developmental delay, it was found to be 28.13%. For most of the age intervals and for the whole participants, the prevalence rate of global developmental delay is higher compared to other studies conducted in different parts of the world. This is the case as we compare the proportions here with what has been found in United Arab Emirates. In UAE the prevalence of global developmental delay was 8.4% (Eapen et al. 2006). In the same way most of the proportions in current study are higher than what has been observed in Colombian study, which has showed that 10.8% exhibited global developmental delay (van Meerbeke, Talero-Gutierrez, & Gonzalez-Reyes, 2007). Similarly, the proportion of global developmental delay is higher for most age intervals when we compare the proportions to the data obtained on international adoptees, which is 14% (Miller, Kiernan,Mathers, &Klein-Gitelman, 1995). In the same manner our data are higher than that which was reported for Korean children, which was 11.1% (Bang, 2008). The results obtained in this research may be comparable to what has been found from foster care homes where the researchers determined that 34% of the children manifested delayed development in two or more areas of functioning (Lesile et al. 2002). Furthermore, for this group of children the prevalence of global developmental delay ranged between 13 and 62% (Lesile, Gordon, Ganger, & Gist, 2002). As one may see from the proportions shown, for most of the intervals, the case was in line with what has been discussed in this paragraph. But the proportion for 48 months age interval, which was 10.13%, was comparable to what has been

reported by Drillien et al. (1988), which was 10% and comparable to the Colombian finding as well, which was 10.8%. Moreover, the proportion for this age interval was also comparable to what has been reported on adoptees from Ethiopia to Belgium. The proportion for this latter group was 12% (Meeus, Peeters, Ramet, Van Gompel &Wojciechowski, 2010) which is closer to 10.13%, which is the rate for the current sample of children in 48 months age interval. Also, it was closer to that of the Korean group which is shown above.

In the above paragraph it is indicated that infants and young children who exhibited global developmental delay are large in number compared to several research findings shown. This finding may be seen as a signal to watch out how parents/care givers raise their children. The proportion we have seen is very much similar to what have been observed in foster care homes. One may suggest different factors contributing to this. One possible reason can be that parents or caregivers do not have adequate understanding about what they can do for their children so that their children can progress well by acquiring all developmental skills in age appropriate manner. As it was mentioned with respect to different developmental domains above parents may not create favorable play or exploratory environment for their children that may stifle development in their children. In some cases parents may be out of home for much of the day leaving the child with maid or in the neighborhood and with this result in inappropriate care and support that hamper developmental skills. These and other possible reasons can be cited as to why most infants and children showed global developmental delay.

Conclusion

Based on the findings of the research the following conclusions are drawn:

- From all the infants and young children involved in the study 28.13% exhibited global developmental delay, i.e., delay in two or more areas of development.
- In almost all age categories more male infants and young children showed global developmental delay compared to their female counterparts.
- From all the domains of development more delayed development was seen in fine motor domain as 30.53% of infants and young children manifested delayed development in this domain. The second one was personal social domain in which 21.15% of infants and young children showed delayed development. The third place was taken by delayed development in problem solving domain where by 18.28% of infants and young children revealed delayed development in this domain of development. 14.35% and 6.89% of all infants and young

children that took part in this study showed delayed development in gross motor and communication domains respectively.

Recommendations

Based on the findings of this study the researcher would like to recommend the following:

- Further study should be conducted to uncover the risk factors for developmental delays in specific areas and for global developmental delay as significant number of infants and young children exhibited delays in their development.
- Effort should be made on the part of all stakeholders to institute developmental assessment early in the lives of children so that children would be benefited from early intervention when they need it.
- In collaboration with stakeholders training would be organized to parents, preschool teachers, and health extension workers on developmental delays and how to detect it early in the lives of children and the importance of intervention on addressing delayed development.

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