Original Article

# Growth status of children in well-baby outpatient clinics and related factors

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## Abstract

**Aim:** The aim of this study was to determine the state of growth during follow-up of healthy children and the factors affecting growth.

**Material and Methods:** The patient cards of the infants who were born in 2002 and followed up in the well-baby outpatient clinic in Gazi University, Medical Faculty regularly for at least 18 months were examined retrospectively. Their sociodemographic properties including age, education level, occupation of the parents, if the mother was working, caretakers and gender, gestational week, birth weight, birth height and mode of nutrition (breastmilk, formula, cow's milk, period of feeding, etc.) and growth of the babies (month, percentile) were recorded. Number of siblings and ages of the siblings were also recorded and the children with and without growth problems were compared in terms of these properties.

**Results:** It was found that 290 (39.3%) of 739 children who were followed up continued to grow up in the percentile in which they started (normal growth), 188 (25.4%) lost 2 or more percentiles in any month (growth retardation) and 261 (35.3%) lost less than 2 percentiles (decelerated growth). Deceleration/retardation in growth was observed most commonly in the 9th month. Deceleration in growth was found in the 6th month in 23.6% of the group with deceleration in growth, in the 9th month in 50.2%, in the 12th month in 15.8% and in the 18th month in 3.9%. Growth retardation was found in the 6th month in 35.8% of the group with growth retardation, in the 9th month in 38.0% and in the 18th month in 4.3%. It was found that receiving formula and presence of infection were the main risk factors in terms of deceleration of growth and unemployed mother, the lenght of the total time of breastfeeding and presence of infection were the main risk factors in terms of growth retardation.

**Conclusions**: This study shows the importance of follow-up of growth of children in outpatient clinics for healthy children. It was found that detailed examination and recording of non-organic causes is necessary in addition to investigation of pathological causes of growth retardation. Since it was observed that elimination of the defects determined and educating the family about nutrition and supporting growth had a positive impact on growth retardation, it was concluded that all children should be followed up regularly especially in the first years of life. (Türk Ped Arş 2014; 49: 104-10)

**Key words:** Growth, growth and developmental delay, development, follow-up of healthy child

## Introduction

Follow-up of growth is one of the important components of follow-up of children's health. The aim of follow-up of growth is to determine any deceleration in growth before nutritional disorder develops and to take precautions. If growth retardation is determined early, it does not lead to permanent changes. If nutritional disorder develops, it leads to permanent changes including retardation in cognitive development, learning difficulty, behavioral disorders and retardation in language development and reading age (1, 2).

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Growth retardation is mostly related with insufficient calorie intake; the cause is organic in a small portion. The causes of organic growth retardation include failure to suck, failure to swallow, failure to breastfeed, digestion-absorbtion disorder, poor feeding, reflux and increased metabolism rate. Non-organic growth retardation is disruption of the growth of the child without an underlying physical disease. It occurs as a result of disruption of the care of the child related with psychosocial causes including divorce of the parents, changing of the caretaker, experience of a great loss or sorrow at home, poor mother-child interaction, wrong or insufficient nutritional method, presence of psychological disorder in the mother, extraordinary feeding beliefs of the mother, errors in preparation of food and child neglect (3).

Since growth is an indication of the health state, children should be followed up at regular intervals. In the first two years of life, growth is affected mostly by nutrition and feeding recommendations are very important during this period. In the well-baby follow-up visits which are realized at least every 2-3 months in the first year and every 6-12 months in the following years, the child's height and weight should be measured, recorded and evaluated with growth charts each time. Deceleration of growth and loss of two main percentiles are early signs for the diagnosis even if the child is in the appropriate percentile for age (4).

In this study, it was aimed to determine the frequency of growth deceleration/retardation in children who had problems in growth during well-baby outpatient follow-up visits at Gazi University, Medical Faculty, the month during which it occured mostly and the causes of growth problems and to elucidate the contibution of early recognition of this deceleration to treatment and the child's health.

**Material and Methods**

In this study which was conducted as retrospective screening of follow-up files at Gazi University, Medical Faculty, well-baby outpatient clinic, the babies who were born in 2002 and followed up in the well-baby outpatient clinic regularly at least for 18 months (15th day, 2-4-6-9-12 and 18th month) were included in the study. Low birth weight and premature delivery and irregular follow-up in the first 18 months were determined as study exclusion criteria. The well-baby outpatient follow-up cards of the babies included in the study were examined and the sociodemographic properties (age, education, occupation of the parents, gender of the baby, gestational age of the baby, birth weight, birth height, if the mother was working, who the caretaker was, number of siblings, ages of siblings, etc.), mode of nutrition of the baby (breastmilk, formula, cow's milk, how the baby was fed for how long) and growth of the baby (percentile of the baby according to reference growth charts) were recorded. Reference growth charts prepared by Neyzi et al. (5) were used for growth monitoring.

The babies were divided into three groups according to weight gain during their 18-month follow-up:

1. Normal growth (group A): the babies whose weight percentiles did not decrease at all, who maintained their percentiles or whose percentiles increased gradually.
2. Decelerated growth (group B): the babies whose body weights lost less than two percentiles compared to the previous percentile at any time.

3. Growth retardation (group C): the babies whose body weights lost more than two percentiles compared to the previous percentile at any time.

**Statistical analysis**

The above-mentioned groups were compared in terms of sociodemographic properties, nutritional properties and accompanying diseases. Chi-square and Kruskal Wallis multiple comparison tests were used for comparisons. In babies who had growth retardation/deceleration, the causes were investigated and classified as organic (infection, anemia, chronic diseases etc.) and non-organic (intra-familial problems, neglect, change of the caretaker etc.) causes. It was planned to follow up the babies who had growth retardation/deceleration up to the age of ten years. In the subjects who could be reached, it was evaluated if the growth curve improved at the age of ten.

**Results**

379 (51.2%) of 739 subjects who were born in Gazi University, Medical Faculty between 01.01.2002 and 12.31.2002 and followed up regularly at least for 18 months in the well-child outpatient clinic were female and 360 48.7%) were male. While 290 (39.3%) of the subjects had a normal growht, 261 (35.3%) subjects lost less than two percentiles; 188 (25.4%) lost two or more percentiles at any follow-up visit (growth retardation). It was observed that growth retardation/deceleration occured most frequently at the 9th month. In group B, growth deceleration was observed at the 6th month in 23.6% of the children, at the 9th month in 50.2%, at the 12th month in 15.8% and at the 18th month in 3.9%. In group C, growth retardation was observed at the 6th month in 35.8%, at the 9th month in 38.0%, at the 12th month in 8.6% and at the 18th month in 4.3%.

The three groups were compared in terms of sociodemographic properties, nutritional patterns, accompanying diseases and long-term follow-up and the findings of these comparisons were as follows:

**Sociodemographic properties**
The results of the comparison of these three groups in terms of sociodemographic properties are shown in Table 1.

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**Table 1. Sociodemographic factors which affect growth**

| | Group A (n=29) | Group B (n=261) | Group C (n=188) | p |
|---|---|---|---|---|
| Gender | | | | |
| Male | 133 (45.9%) | 138 (52.9%) | 89 (47.3%) | 0.235 |
| Female | 157 (54.1%) | 123 (47.1%) | 99 (52.7%) | |
| Birth weight (g) | 3241.1±578.32 | 3299.2±462.7 | 3315.2±464 | 0.016 |
| Birth height (cm) | 49.5±2.36 | 49.8±2.30 | 49.9±2.11 | 0.06 |
| Median number of siblings | 0 (0-3) | 0 (0-3) | 1 (0-3) | <0.001 |
| Median gestational age | 38 (30-42) | 39 (34-42) | 39 (33-42) | 0.105 |
| Median maternal age | 28.7±4.81 | 28.5±5.29 | 27.8±5.13 | 0.077 |
| Time to start working of the mother | 7.62±4.78 months | 8.1±4.96 months | 8.8±5.91 months | 0.476 |
| Caregiver | | | | |
| Mother | 151 (52.2%) | 142 (54.4%) | 116 (61.7%) | |
| Mother-grandmother | 88 (30.4%) | 80 (30.7%) | 46 (24.5%) | 0.005 |
| Mother-caregiver | 50 (17.3%) | 35 (13.4%) | 20 (10.6%) | |
| Kindergarten | 0 (0%) | 4 (1.5%) | 6 (3.2%) | |
| Maternal education level | | | | |
| Primary school | 48 (16.7%) | 45 (17.2%) | 45 (23.9%) | |
| High-school | 96 (33.3%) | 95 (36.4%) | 72 (38.3%) | 0.081 |
| University | 144 (50%) | 121 (46.4%) | 71 (37.8%) | |
| Maternal occupation | | | | |
| Housewife | 118 (41%) | 129 (49.4%) | 108 (57.4%) | 0.012 |
| Officer-self-employment | 170 (59.0%) | 132 (50.5%) | 80 (42.6%) | |

**Table 2. Growht states of the children by nutritional characteristics**

| Nutritional pattern (months) | Group A (n=290) | Group B (n=261) | Group C (n=188) | p |
|---|---|---|---|---|
| Time of exclusive breastfeeding | 2.99±1.59 | 3.14±1.38 | 3.36±1.35* | 0.024 |
| Total time of breastfeeding | 13.22±7.44 | 14.7±7.09 | 17.89±7.13*** | 0.001 |
| Time of onset of formula | 4.08±2.87 | 4.68±2.93* | 5.82±3.84*** | 0.001 |
| Time of onset of cow's milk | 12.73±5.49 | 11.95±5.43 | 13.40±6.07 | 0.074 |
| Time of onset of solid foods | 5.56±1.05 | 5.53±1.09 | 5.80±1.12*** | 0.015 |

*: Statistically significant difference compared to the group with normal growth (p<0.05)
**: Statistically significant difference compared to the group with decelerated growth (p<0.05)

The mean birth weight in Group C was found to be significantly higher compared to Group A (p=0.005).

In group C, the median number of siblings of the subjects was found to be significantly higher compared to both group B (p=0.019) and group A (p<0.001).

In group C, the frequency of the mother's taking care of her baby alone was found to be markedly higher compared to the other groups (p<0.001).

The prevalence of the mother's being a housewife was found to be significantly higher compared to group A (p=0.002).

**Nutrition patterns**
The comparison of the nutrition patterns of the subjects between the groups is shown in Table 2.

In group C, it was observed that the times of exclusive breastfeeding and total breastfeeding were significantly longer compared to the other groups. In group C, the mean month

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of initiation of formula was found to be significantly higher compared to both group B and group A. The time to start solid foods was found to be significantly delayed in Group C compared to the other groups.

**Accompanying diseases**

In the assessment of accompanying diseases in the groups, various acute infections (gastroenteritis, upper respiratory tract infection, urinary tract infection, etc.) were found in 5.2% (15) of the babies in Group A, in 9.6% (25) of the babies in Group B and in 12.8% (24) of the babies in Group C (p=0.013). The mean infection month was found to be 10.2±5.31, 8.84±3.17 and 9.5±4.07, respectivley (p=0.563). Iron deficiency anemia was found in 2.1% (6) of the babies in Group A, in 1.1% (3) of the babies in Group B and in 3.7% (7) of the babies in Group C (p=0.179).

Retrospective stepwise logistic regression analysis was performed to determine the most efficient risk factors causing to occurence of deceleration in Group B compared to Group A. According to the results of the multivariate logistic regression analysis, the main risk factors which affected growth deceleration included formula intake (odds ratio: 1.679, 95% confidence interval: 1.133-2.461, p=0.010) and presence of infection (odds ratio: 2.136, 95% confidence interval: 1.007-4.528, p=0.048). During the follow-up period, it was found that the risk of growth deceleration increased by 1.7-fold (95% confidence interval: 1.1-2.5) (p=0.010) in cases where formula was started compared to the cases where formula was not started and the risk of growth deceleration increased by 2.1-fold (95% confidence interval: 1.01-4.53) (p=0.048) in the babies in whom infection was observed compared to the ones in whom infection was not observed.

Retrospective stepwise logistic regression analysis was performed to determine the most efficient risk factors which caused to growth deceleration in Group C compared to Group A. According to the results of the multivariate logistic regression analysis, the main risk factors which affected growth deceleration included unemployment of the mother (odds ratio: 1.713, 95% confidence interval: 1.134-2.590, p=0.011), the time of breastfeeding (odds ratio: 1.073, 95% confidence interval: 1.038-1.110, p<0.001) and presence of infection (odds ratio: 3,453, 95% confidence interval: 1.590-7.497, p=0.002). It was found that the fact that the mother was working increased the risk of growth deceleration by 1.7-fold compared to the cases where the mother was not working

(95% confidence interval: 1.1-2.6) p=0.011), each one month increase in the breastfeeding period increased the risk of growth deceleration by 1.1-fold (1.04-1.1) (p<0.001) and the risk of growth deceleration increased by 3,4-fold (95% confidence interval: 1.6-7.5) (p=0.002) in the babies in whom infection was observed compared to the ones in whom infection was not observed.

The frequency of anemia was found to be 2.1% in Group A, 1.1% in group B and 3.7% in Group C and the difference between the groups was not statistically significant (p=0.179).

**Long-term follow-up of the subjects who had growth retardation/deceleration**

The states of the children in Group B and C at the 18th month are shown in Table 3. It was found that 192 of the subjects in Group B (73.6%) continued with the percentile which they were reduced to and 60 (23%) returned to the percentile they lost. It was observed that 9 subjects (3.4%) continued to lose percentile. 72.3% of the subjects in Group C continued with the percentile which they were reduced to, 11.7% returned to the percentile they lost and 16% continued to lose percentile.

In the 18$^{th}$ month follow-up, it was planned to realize long-term follow-up in a total of 39 subjects who continued to lose percentile. In follow-up visit performed at the age of 10, 2 (22.2%) of 9 subjects who had growth deceleration could not be reached. It was found that the weight percentiles increased or stayed stable until the age of four years and decrease in percentiles stopped in 7 subjects who could be reached. In five of these (55.6%) growth continued at the reduced percentile and two (22.2%) returned to the first percentile. In Group C, 11 (36.7%) of 30 subjects who did not improve at the 18$^{th}$ month could not be reached at the age of 10 years. It was observed that growth continued at the reduced percentile in 10 (33.3%) of 19 subjects who could be reached and 9 (30) returned to the old percentile. No chronic disease diagnosed later was found in any of these patients.

**Discussion**

Health should be developed and supported in order to decrease and prevent the mortality in babies and children and the rates of morbidity and disability. Thus, cildren's health should be regularly followed up for children to have a longer (as adults and elderly), healthy and productive life (6). In the study of Uğur et al. (7), growths of 206 healthy children

**Table 3. States of the children with growth deceleration and growth retardation at the 18$^{th}$ month**

|  | Group B (n=261) | Group C (n=188) |
|---|---|---|
| The ones who continued at the percentile which they were reduced to | 192 (73.6%) | 136 (72.3%) |
| The ones who returned back to the lost percentile | 60 (23%) | 22 (11.7%) |
| The ones who continued to lose percentile | 9 (3.4%) | 30 (16%) |

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in the 0-2 age group who were followed up in the Maternal and Infant Health and Family Planning Center in İstanbul in 1987 were evaluated. Nutritional nanism was found in 2% of the children who were evaluated by Wellcome classification and decreased weight (mild or moderate acute malnutrition) was found in 13%. It was concluded that growth of children should be followed up by known reference curves. The fact that growth retardation/deceleration occured most commonly at the 6-9th months considering regular follow-up visits suggests that problems might have been experienced in starting solid foods and failure to provide sufficient solid foods at the appropriate time might be the actual factor in growth retardation.

In the study performed by Hon et al. (8), boys constituted 49% of the children who were found to have growth and developmental retardation. In our study, no significant difference was found between the groups in terms of gender.

There is a significant positive correlation between increase in weight and economical poverty, gestational age and birth weight in children (9). Studies have shown that children with low or very low birth weight have a high risk in terms of growth retardation in the postnatal and long-term follow-up (10-12). However, in our study, birht weight was found to be significantly higher in the retardation group compared to the other groups (p=0.005). This may be explained by the fact that there was no very low birth weight and premature baby in our study group. The finding that the subjects with higher birth weight values lost more percentiles in the follow-up in our study group which was consisted of babies with normal birth weight may be explained with the fact that their genetic potentials were actually lower and they returned to their actual genetic potential even though they were born large for any reason. Although the size of the baby is affected by genetic factors, size at birth and growth in the first two years after delivery are mainly dependent on the maternal and placental factors and nutritional status. The effect of genetic factors later become prominent and the height of the child is generally located on the curve compatible with the target height calculated by parental heights after the age of two years. Therefore, babies born smaller compared to their genetic potentials generally settle on the curve of their target heights by passing over curves on the growth chart in the postnatal period up to the 18th month. The ones born larger compared to their genetic potentials are settled on the new curve compatible with their potentials at about the 18th month by frequently decreasing on the curve from the 3-6th month. If there is no abnormality in the factors affecting the growth of the baby (nutrition, hormonal status, general physical health), the growth of the child continues on the same curve in a consistent way. In addition, growth rates of the babies who are breastfed are higher in the early childhood period and lower afterwards (13). In our study, the growth curves in the follow-up visits at the 18th month and afterwards were evaluated considering these points.

In a study performed in our country, it was found that babies could refuse breastfeeding because of change in feeding arrangement when the mother started working at an early period (14). In the study of Chatoor et al. (2), it was observed that psychosocial factors including mother-child relationship and maternal education level and socioeconomical status were effective on the child's cognitive development and nutrition. When the groups were compared in terms of the individuals who took care of the baby in our study, it was found that the frequency of taking care of the baby alone by the mother was significantly higher in Group C compared to the other groups and the fact that the mother was not working was a an efficient risk factor in terms of growth retardation. Since detailed information about the social support status of the families was absent in the follow-up cards, it was not possible to state clearly what kind of a support the mothers who worked and did not work received about taking care of their babies in this study. However, it was thought that housewifes who did not have a wage-earning employment could have been deprived of the support of the father and other relatives (grandmothers) because of the view that "housewife mothers can take care of both their home and children by themselves and that they do not need help". In fact, the mother who struggles with domestic responsibilities for the whole day may not have sufficient time for her child. If the reason of the mother's unemployment is the state of having a lower education, this may affect the child's nutrition and psychosocial development negatively. In addition, poor economical status in a family where the mother is not working may have a negative effect on the child's growth and development. Therefore, the family and especially the mother should be supported in terms of nutrition of the baby and education and consultancy service should be given. In our study, growth retardation was found with a higher rate in children who had a higher number of siblings. This may be explained with the reduced time per child for taking care. Especially in families where the age difference between siblings is less than 2 years, growth and development of children may be affected negatively because of disrupted health of the mother due to frequent pregnancies and the difficulty of taking care of two babies/children who are very close in age. In addition, requirements of each child including nutrition can not be met sufficiently in a multi-child family if the socioeconomical level is also low and the possibility of growth retardation increases in such a case.

In the study of Emond et al. (15), the most important postnatal factors associated with growth retardation included type and efficiency of nutrition. Poor sucking is the most important sign in the first 8 weeks of life in children who are both breastfed and fed with nursing bottle. After the 8th week, the time of breastfeeding, the amount of milk taken and weaning difficulties are the most important determinative factors. In our country, breastfeeding rates of babies are not at the desired level and one of the most important problems related with nursing is starting solid foods early. However, the

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2008 Turkey Demographic and Health Survey data showed that children were breastfed for a considerably long period, but solid foods were started at a very early period (16). In our study, it was found that intake of formula was an efficient risk factor in terms of growth deceleration and the lenght of the total time of breastfeeding was an efficient risk factor in terms of growth retardation. In addition, the time of starting solid foods was found to be significantly higher in the retardation group compared to both the group with normal growth course and the group with growth deceleration. In our community, the necessity of starting solid foods at the 6ᵗʰ month at the latest should be emphasized as well as the benefits of breastfeeding. Children who are exclusively breastfed for a longer time with the thought that breastmilk is beneficial are deprived of vitamins and minerals which are necessary for growth. The most ideal way of nutrition for babies is exclusive breastfeeding for the first 6 months, starting appropriate solid foods after 6 months and continuing breastfeeding up to the age of two years (17, 18). In our study, there are no data related with maternal nutrition in the questions used to determine the causes of growth and developmental retardation. Maternal nutrition should also be interrogated in children who are breastfed. The most important limitation of this study is failure to reach detailed nutritional histories of both the babies and mothers, since the study was conducted by retrospective examination of healthy child follow-up cards. Since the type and amount of solid foods given could not be known exactly, it was not possible to examine nutrition errors which could lead to growth retardation.

In presence of acute infection, a decrease in intake of food is expected because of decreased appetite of the baby and growth deceleration and retardation is expected because of energy consumption created by infection in the body. However, growth deceleration and retardation should improve immediately after appropriate feeding after a certain period. In our study, it was observed that acute infection was an efficient risk factor in terms of growth deceleration and retardation. Although it was not possible to understand the reason why some of the subjects whose growths stopped because of infection could not return immediately back to their old percentiles from the follow-up cards used in this study, the reasons which could be considered included frequent problems which we observe in the follow-up visits of children including recurrent infection, pressure by the mother on the child whose appetite is disrupted because of infection, disruption of the eating-feeding relation and chronicity of this disruption.

Urinary tract infection is frequently observed with nonspecific signs and symptoms in infants. It should be considered in the differential diagnosis in an ill infant with fever or in any infant with growth and developmental retardation (19, 20). In celiac disease which is one of the non-infectious diseases, the most common manifestation in the childhood age

group is still growth and developmental retardation excluding the typical form of the disease; in developed countries, severe growth retardation is observed with the lowest rate (21). In the fist three years of life, Turner syndrome should also be considered in the differential diagnosis in girls with unexplained growth reatardation or short stature (22). Early diagnosis and treatment provides good prognosis (23). In the children included in our study, no chronic disease which could affect growth could be found. Hypothryroidism was found in only one child in Group A.

In our study, it was observed that the frequency of iron deficiency anemia was not different between the groups. Prophylactic iron treatment is given from the 4ᵗʰ month in the helathy Child Outpatient Clinic in our University to prevent iron deficiency which is the most common cause of anemia. The fact that few cases of anemia was found in our study was related with this approach.

In our study, the social conditions which could affect the growth of children were addressed as noted in the healthy child follow-up cards. The fact that no pathology was found here should be evaluated carefully. Although our university gives service to a patient population with a higher sociocultural level compared to the whole of Turkey, the underlying cause may be expected to be a non-organic cause including mother-baby interaction, eating-feeding problem and a factor affecting the child's development negatively in the social environment considering the fact that no organic cause could be found in many children who had growth deceleration or retardation. It is thought that strains and concerns about nutrition which the family does not find worth expressing to the physician during the follow-up visit may create problems in nutrition and lead to growth deceleration and retardation.

Another reason of the finding that no social problem was mentioned in the follow-up card might be the fact that the physician did not take a detailed history enough to recognize this or ignored the problem and did not write it on the card. Although it is emphasized that these issues should be addressed with care as well as organic causes during social pediatry training in our univeristy, it is possible that physicians cared about social issues with a lower rate during intensive patient load, since there is a general tendency to focus on organic diseases in medical education and to care about social issues with a lower rate.

The most important limitation of our study was the absence of some information which could render the results of our study significant, but which were not recorded in the files, since the study was conducted as a retrospective examination of follow-up cards. Since the contact information in the files were changed or given imperfectly, the assessments were done in the light of the information on hand, since there were families who could not be reached. Nevertheless,

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it was thought that the study would contribute to the literature, since it included the data of a high number of children who were followed up for a long period. We hope that studies which could be planned prospectively including detailed information which was deficient in this study can close this gap.

Conclusively, the importance of follow-up of growth and development and health of children in healthy-child outpatient clinics was emphasized. While pathological causes were investigated in children with growth retardation, the necessity to examine and record non-organic causes as well in detail was observed (24-26). It was thought that elimination of the defects found and giving families education about nutrition and supporting development affected growth positively and prevented percentile loss from reaching the level of nutritonal disorder and therefore, all children should be regularly followed up especially in the first years of life regularly.

**Ethics Committee Approval:** Ethics Committee Approval has not been received because our study is done by retrospective review of well child care visit notes.

**Informed Consent:** Informed consent has not been received because our study is done by retrospective review of well child care visit notes.

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