Original Article

Awareness of public health nurses and related factors regarding screening for infants with developmental disorder at infant medical examinations

Fusako Inaba*,***, Rumiko Kimura**, Akiko Tsuda**

Abstract

In recent years, the prevalence of infants with developmental disorder has shown an increasing trend, and infant medical examinations have become expected to play a crucial role in the early detection of a developmental disorder. However, many children with suspected developmental disorders are discovered subsequent to the medical examination at three years of age. In this study, to investigate the awareness of public health nurses involved in maternal and child public health care towards screening of infants with developmental disorder and its related factors, 499 respondents completed a self-administered study questionnaire (response rate, 26.3%).

Those who answered that screening of infant developmental disorder was "possible" accounted for 37.3% at the 18-month medical examinations and 58.3% at the 3-year medical examinations, and the proportion was significantly higher at the 3-year. "Undetermined" accounted for 51.9% at 18-month medical examinations and 36.7% at the 3-year medical examinations, and the proportion was significantly higher for the 18-month examination.

Regarding the actual screening of infants with developmental disorder, those who used a screening tool at the 18-month and 3-year medical examinations accounted for only 16.4% and 18.6% of respondents, respectively, and there was no relationship between using a tool and the potential of the screening. When the responses to the potential for the early detection of developmental disorder were compared among the districts, a significantly larger proportion of respondents in the special districts answered "possible" for both medical examinations and stated that cooperation with treatment and education institutes and nursery schools was well established. Regarding the 18-month screening, those who answered "possible" for the screening of infant developmental disorder had more frequently worked for three years or a longer period in the current service whereas public health nurses in their 20s answered "undetermined" more frequently. Regarding the 3-year medical examination, those who worked longer years and had longer experience of maternal and child public health care more frequently answered "impossible" regarding the screening.

Key Words

infant medical examination, developmental disorder, early detection,
awareness of the public health nurse, developmental screening

Introduction

Infant medical examination in Japan started in 1965, and more than 90% of infants are regularly examined nationwide. Currently, infant medical examinations are carried out mostly at the ages of 18 months and 3 years, and they are significant in safeguarding the mental and physical health of children and their growth.

Regarding the aim of infant medical examinations, attention is paid to not only early disease detection, but also to arrangements of the child-rearing environment, support, and prevention of child abuse in order to deal with a variety of child rearing-related problems, such

*   Doctoral Course, Division of Health Sciences, Kanazawa University Graduate School of Medical Science
**   Faculty of Health Science, Institute of Medical, Pharmaceutical and Health Science, Kanazawa University
***   Naka welfare health center ,Yokohama City

as anxiety in child rearing and child abuse, while taking into account the recent trend towards nuclear families and changes in social background [1,2] . According to the Japanese Support Act for Developmental Disorders, sufficient attention has been paid to the early detection of developmental disorder in infant medical examinations since 2005. It is expected that efficient detection methods, support after infant medical examination, and cooperation with relevant institutes [3] will play a greater role in child health.

Even though more than 90% of all infants undergo infant medical examinations, developmental disorder was reported in 9.3% of children in Tottori Prefecture and 8.2% in Tochigi Prefecture at the infant medical examination for 5-year-olds, although no development abnormality had been detected at the 3-year-old examination [4] . According to a survey by the Ministry of Education, Culture, Sports, Science and Technology, the prevalence of infants with developmental disorder is showing an increasing trend from 6.3% in 2002 to 6.5% in 2012 [5] . This trend implies that infants with developmental disorder are not being detected sufficiently early at the 3-year-old medical examination.

Infants with developmental disorder often have problems such as "child-rearing difficulties" and "communication difficulties" from infancy, and those who provide child care have trouble understanding these characteristics. As a result, a secondary developmental disorder can be induced by inappropriate handling of such infants by adults [6] . In addition, developmental problems are a risk factor for child abuse [7] , and infants with developmental disorder are 4-10 times more likely to be abused as compared with healthy infants [8] , which suggests that early detection is important. In particular, formation of attachment is retarded among infants with a pervasive developmental disorder in higher function, and the delay becomes a high risk for child abuse because it can create severe frustration in the child-rearing provider [9]. Therefore, it is necessary to identify such possibilities as soon as possible and start support.

The American Academy of Pediatrics issued a proposal on the detection and management of autism spectrum disorder [10] , and indicated that all healthy infants that visit pediatric clinics should undergo check-ups at 18 and 24 months of age. In Finland, public health centers assume services for the health of preschool children and check-ups

are done 8 times before 1 year of age, 4 times at 1-2 years, and once at 2 years or older [11] . Taken together, systems of screening and a frequent follow-up by pediatricians from an early stage have been well organized in Western countries.

In Japan, meanwhile, despite a few differences among municipalities, infant medical examinations are done, as previously mentioned, at 18-months and at 3-years of age in accordance with the Maternal and Child Health Law. It is markedly rare for pediatric psychiatrists to be present at the medical examination or to have an opportunity for early diagnosis of infant developmental disorder [12]. Furthermore, there are difficulties in detecting a disorder correctly within the limited time and at the places of medical examination that a number of infants visit, and there is a qualitative problem in that staff members often fail to respond appropriately or to reach the expected technical level [12,13] . As compared with abnormal physical symptoms and developmental retardation, it has been reported it is more difficult to share common recognition of problems in abnormal child behavior, impaired communication, and social adaptation detected at the medical examination between guardians and medical care providers [14]. Taken together, these findings indicate that, in an environment where there are a variety of problems, screening for infants with developmental disorder is being done by pediatricians in foreign countries and mostly by public health nurses（PHN）in Japan.

With regard to early detection of infants with developmental disorder, there are a number of studies on the screening categories [15] for early diagnosis and the utility of the 5-year medical examination. However, studies on PHN have rarely been reported and to our knowledge, no study has investigated in detail the awareness of PHN and related factors, such as how public nurses regard the potential of the screening.

The aim of this study was to investigate the awareness of PHN involved in maternal and child public health care towards screening for infants with developmental disorder and its related factors.

Methods

1. Study design

The current status of development disorder screening was investigated. Via a self-completed questionnaire, the awareness of PHS towards developmental screening and

related factors at the medical examinations for infants aged 18-months and 3- years were investigated.

2. Subjects and study period

The subjects comprised PHN involved in infant medical examinations nationwide. Participation in the survey was requested from the institutional president in charge of organizing infant medical examinations in each of 29 prefectures selected for the study with attention paid to avoiding a regional bias. Consent to the study was obtained from 23 prefectures and questionnaire sheets were distributed to each institute after the number of maternal and child public health nurses was confirmed; the answers were then collected separately. The study was carried out between September and December 2009.

3. Study content

1) Attributes of public health nurses

Districts, age, years of service, years of experience of maternal and child public health and work period in the current service.

2) Status of medical examinations

The frequency of cooperation with relevant institutes after screening was asked and categorized into 3 groups. The survey was carried out with regard to the medical examinations for infants aged 18-months and 3-years and other medical examinations. Use of screening tools and their details, and the observation points used when tools were not employed were described freely for each medical examination.

3) Awareness of public health nurses towards early detection of infants with developmental disorder

(1) Aims of infant medical examinations

With regard to the aims of infant medical examinations, an answer was selected from multiple choices, and priority ranking was examined for each medical examination.

(2) Potential for the early detection of developmental disorder

With regard to the possibilities of early detection of developmental disorder, an answer was selected from three choices for each medical examination: "possible", "undetermined", and "impossible". The observation points for answering that early detection of developmental disorder was "possible" and the reasons for answering that early detection was "impossible" were answered in a free-style description.

(3) Difficulties in screening for developmental disorder

"Difficult situations for judgment during screening for infants with developmental disorder" was answered in a free-style description. "Influence of words and behavior of guardians on public health nurses" was selected from multiple choices.

4. Terminology

According to the Japanese Support Act for Developmental Disorders, developmental disorder includes a pervasive developmental disorder such as Autism and Asperger syndrome, Learning disorder, Attention deficit hyperactivity disorder and analogous brain dysfunctions, which generally present symptoms at a young age [3].

In this study, some comparisons were made according the size of the municipalities that administer the public health center, municipalities were categorized into the following three groups: special district and government-designated cities (special districts), cities other than special districts and government-designated cities (other cities), and villages and towns.

5. Analytical method

For free-style descriptions, the contents were analyzed qualitatively and categorized, and proportions were calculated. Data on the status of screening for developmental disorder and awareness of PHN towards it were collected for each medical examination. A two-sample test was employed for comparison of proportions for the two medical examinations. With regard to the relationship of factors in comparing the potential of screening, the following statistical methods were employed: proportions by the chi-square test; years of service and years of experience of maternal and child public health care by the Kruskal-Wallis test; and multiple comparisons by Bonferroni's test. For statistical data analysis, statistics software SPSS version 19.0 for Windows was employed. A p value of less than 0.05 was considered significant.

6. Ethical consideration

Request sheets and questionnaires describing the aims and methods of the survey were distributed. They stated that the answers were made anonymously, no individual or affiliation could be identified, and there would be no disadvantage if participation in this study was refused; informed consent was obtained by a response

Table 1　Attributes of public health nurses

Item	The whole n = 499	Districts			p Value
		Special districts n = 81	Other cities n = 289	Towns and villages n = 129	
Age[a]　(years)					
22-29	140　(28.1)	23　(28.4)	77　(26.6)	40　(31.0)	
30-39	216　(43.3)	30　(37.0)	126　(43.6)	60　(46.5)	.344
40-60	143　(28.6)	28　(34.6)	86　(29.8)	29　(22.5)	
Years of service [b]　(years)	10.7　(4.0-15.0)	10.0　(3.0-18.0)	10.0　(4.5-15.0)	8.0　(3.0-13.0)	.055
	10.64 ± 7.86	11.99 ± 9.02	10.78 ± 7.50	9.47 ± 7.78	
Years of experience of maternal and child public health [c]　(years)	5.0　(2.0-10.0)	6.0　(2.0-14.0)	5.0　(2.0-10.0)	5.0　(2.0-10.0)	.432
	7.34 ± 6.55	8.76 ± 8.02	7.10 ± 6.02	7.01 ± 6.60	
Work period in the current service [d]　(years)	n = 396	n = 67	n = 232	n = 97	
Irregular	181　(45.7)	13　(19.4)	113　(48.7)	55　(56.7)	
Less than three years	92　(23.2)	18　(26.9)	47　(20.3)	27　(27.8)	<.001***
Three years or longer	123　(31.1)	36　(53.7)	72　(31.0)	15　(15.5)	

Notes. a ,d ; Value are number　(%) . P values denote the overall significance of differences between districts by the chi-square test .
b ,c ; upper row is median　(inter quartile range) , lower row is mean ± SD　(standard deviation) . P values denote the overall significance of differences between districts by the Kruskal-Wallis test.
*** p < .001

to the questionnaire. The results of this study would be not only reported to the affiliations and municipalities of the subjects, but also presented at related academic meetings and in academic papers, and they would be used exclusively for research purposes. The collected data were stored in a place that could be locked, and were strictly managed to prevent leaks, theft, and misplacement.

The study was approved by the ethical committee of the Graduate School of Medical Sciences and College of Medical, Kanazawa University（approval No. 213）.

Results

1. Attributes of public health nurses（Table 1）

As many questions as possible, for which answers were collected, were adopted for the analysis, and the numbers of responses differed among categories.

There were 81 respondents（16.2%）from the special districts, 289（57.9%）from other cities, and 129（25.9%）from towns and villages; in total, 499 respondents comprised the subjects of the study（response rate, 26.3%）. Table 1 shows the attributes of the subjects in each district category. With regard to demographics, 216 PHN were aged 30–39 years and accounted for the largest proportion of respondents at 43.3%.

The average number of years of service was 10.64　± 7.86 years, and the average number of years of experience of maternal and child public health was 7.34 ± 6.55 years; there was no significant difference among districts. With regard to the average work period in the current service, the most frequent answers were "three years or longer"

in the special districts, and "irregular" in other cities and towns and villages, indicating a significant difference among districts（p < .001）.

2. Frequency of cooperation with relevant institutes（Table 2）

With regard to the frequency of cooperation between public health centers and relevant institutes after screening, cooperation with "treatment and education institutes" was reported by 51.2% and "nursery schools" by 49.7%. "elementary schools", "specialized hospitals", and "consultation office for children" accounted for a small proportion of responses. Cooperation with treatment and education institutes was most frequently established in the special districts, followed by other cities and towns and villages, with a significant inter-district difference（p<.001）. Cooperation with nursery schools and kindergarten was also well established in the special districts, with an inter-district difference（p<.05）.

3. Status of infant medical examinations

1）Status of screening for developmental disorder（Table 3）

In the medical examination, a screening tool was used for only 16.4% of infants aged 18-months, and 18.6% of infants aged 3-years. The easy to use Enjoji method for medical examination was the most frequently used tool at both medical examinations. The Kyoto scale of psychological development（K scale）and Modified checklist for autism in toddlers（M-CHAT）were often used at the 18-month medical examination, whereas the

K scale and a tool made by the municipalities were often used for screening 3-year-old infants.

When a tool was not used, child development was evaluated mostly on the basis of "tasks done by the infants" at both medical examinations, followed by "descriptions made by guardians", "observation of child behavior" and "interviews with guardians".

4. Awareness of public health nurses towards early detection of infants with developmental disorder

（Table 4）

1）Aims of infant medical examination

The most prioritized aim of medical examinations was compared. "Early detection of retarded development" was the most common answer for both infant medical

Table 2　Frequency of cooperation with relevant institutes

Cooperation with relevant institutes		The whole	Districts			p Value
			Special districts n = 81	Other cities n = 289	Towns and villages n = 129	
Treatment and education institutes	Frequently	248 (51.2)	60 (74.1)	145 (52.3)	43 (34.1)	<.001***
	Sometimes	169 (34.9)	18 (22.2)	99 (35.8)	52 (41.3)	
	Few	67 (13.9)	3 (3.7)	33 (11.9)	31 (24.6)	
Nursery schools	Frequently	244 (49.7)	50 (61.7)	124 (44.1)	70 (54.3)	.048*
	Sometimes	212 (43.2)	26 (32.1)	134 (47.7)	52 (40.3)	
	Few	35 (7.1)	5 (6.2)	23 (8.2)	7 (5.4)	
Kindergarten	Frequently	103 (21.6)	27 (33.8)	53 (19.5)	23 (18.5)	.031*
	Sometimes	200 (42.0)	31 (38.7)	121 (44.5)	48 (38.8)	
	Few	173 (36.4)	22 (27.5)	98 (36.0)	53 (42.7)	
Consultation office for children	Frequently	75 (15.5)	21 (25.9)	39 (14.1)	15 (12.0)	.061
	Sometimes	208 (43.2)	33 (40.7)	117 (42.4)	58 (46.4)	
	Few	199 (41.3)	27 (33.4)	120 (43.5)	52 (41.6)	
Specialized hospitals	Frequently	39 (8.2)	8 (9.9)	22 (8.0)	9 (7.3)	.518
	Sometimes	195 (40.8)	26 (32.1)	115 (42.0)	54 (43.9)	
	Few	244 (51.0)	47 (58.0)	137 (50.0)	60 (48.8)	
Elementary schools	Frequently	29 (6.1)	7 (8.8)	10 (3.7)	12 (9.7)	<.001***
	Sometimes	161 (33.8)	31 (38.8)	65 (23.8)	65 (52.4)	
	Few	287 (60.1)	42 (52.4)	198 (72.5)	47 (37.9)	

Notes. Value are number （%）, P values denote the overall significance of differences between districts by the chi-square test.
* p < .05, *** p < .001

Table 3　Status of screening for developmental disorder

Status of screening tools	Medical examination		p Value
	18 months	3 years	
Use of screening tools			
Yes	82 (16.4)	93 (18.6)	.623
No	417 (83.6)	406 (81.4)	
Use of screening tools and their details			
The Enjoji method	31 (6.2)	31 (6.2)	1.000
K scale	21 (4.2)	24 (4.8)	.873
M-CHAT	17 (3.4)	4 (0.8)	.781
Tool made by the municipalities	13 (2.6)	26 (5.2)	.561
Tanaka-Binet Intelligence scale	10 (2.0)	3 (0.6)	.754
Denver developmental screening test	3 (0.6)	3 (0.6)	1.000
Ota stage method	2 (0.4)	3 (0.6)	–
Observation points used when tools are not employed			
Tasks done by the infants	216 (43.3)	198 (39.7)	.421
Descriptions made by guardians	140 (28.1)	124 (24.8)	.461
Observation of child behavior	121 (24.2)	134 (26.9)	.546
Interviews with guardians	120 (24.0)	100 (20.0)	.371
Follow-up of the group	62 (12.4)	61 (12.2)	.964

Notes. n=499, K scale = the kyoto scale of psychological development. M-CHAT = modified checklist for autism in toddlers.
Value are number （%）. P values denote the overall significance of differences between infant medical examinations by the two-sample test.
- : Unanalyzable because of the small number of public health nurses.

examinations, and the proportion of nurses giving this answer was significantly higher for the medical examination for infants aged 3 years (p<.05).

2) Status of screening of developmental disorder

(1) Potential for the early detection of developmental disorder

"Possible" accounted for37.3% at the 18-month medical examinations and 58.3% at the 3-year, and the proportion was significantly higher at the 3-year (p<.001). "Undetermined" accounted for 51.9% of responses regarding the 18-month and 36.7% regarding the 3-year medical examinations, and the proportion was significantly higher for the 18-month examination (p<.001).

(2) Observation points among those who answered "possible" to detect developmental disorder at an early stage

The main observation points stated for the 18-month medical examinations were: "child behavior and reaction" at 55.9% of responses, "interpersonal sociality" at 44.0%, and "linguistic expression" at 37.6%. The main points for the 3-year medical examinations were: "interpersonal sociality" at 47.8%, "child behavior and reaction" at 45.7%, and "linguistic expression" at 40.2%. Taken together, these data suggest a similar tendency in both examinations. Despite a low proportion, some respondents answered

"guardian–child relationship".

(3) Reasons for why early detection of infants with developmental disorder was "impossible"

Regarding the 18-month medical examination, "difficult early detection" was answered at 38.9%, followed by "lack of time" at 20.4%, and "problems in the quality of public health nurses" at 16.7%. Regarding the 3-year medical examination, the main reasons were "manpower shortage" at 24.0%, "difficult early detection" at 20.0%, and "lack of time" at 20.0%, which raises problems underlying the system of the medical examinations.

5. Potentials of screening and relevant factors

1) Potentials of screening and relevant factors (attributes of public health nurses)

(Table 5-1)

When the potential of screening was compared among PHN of different ages, there was no significant difference for the 3-year medical examination. However, there was a significant difference in answers for the 18-month medical examination: the answer "undetermined" was more frequently given by nurses in their 20s at 59.3%, while the answer "impossible" was more frequently given by nurses aged over 40 at 16.1%. In addition, there was a significant difference among districts in responses for

Table 4　Awareness of public health nurses towards early detection of infants with developmental disorder

Awareness of screening of developmental disorder	Medical examination				
	n	18 months	n	3 years	p Value
Aims of infant medical examination	486		483		
Early detection of retarded development		199 (40.9)		243 (50.4)	.049*
Support for child rearing		148 (30.5)		120 (24.8)	.301
Early disease detection		139 (28.6)		120 (24.8)	.491
Potential for the early detection of developmental disorder	499		499		
Possible		186 (37.3)		291 (58.3)	<.001***
Undetermined		259 (51.9)		183 (36.7)	<.001***
Impossible		54 (10.8)		25 (5.0)	.401
Observation points among those who answered "possible" to detect developmental disorder at an early stage	186		291		
Child behavior and reaction		104 (55.9)		133 (45.7)	.119
Interpersonal sociality		82 (44.0)		139 (47.8)	.563
linguistic expression		70 (37.6)		117 (40.2)	.725
Task		36 (19.4)		63 (21.6)	.795
Hearing questionnaire		35 (18.8)		37 (12.7)	.477
Understanding		33 (17.7)		53 (18.2)	.953
Guardian-child relationship		27 (14.5)		24 (8.2)	.482
Reasons for why early detection of infants with developmental disorder was "impossible"	54		25		
Difficult early detection		21 (38.9)		5 (20.0)	.213
lack of time		11 (20.4)		5 (20.0)	.491
Problems in the quality of public health nurses		9 (16.7)		2 (8.0)	−
Manpower shortage		6 (11.1)		6 (24.0)	.722
Susceptible to guardians' behavior		5 (9.3)		1 (4.0)	−

Notes. Value are number (%) . P values denote the overall significance of differences between infant medical examinations by the two-sample test.
- : Unanalyzable because of the small number of public health nurses.
* p < .05,　*** p < .001

both medical examinations: the answer "possible" was obtained more frequently in the special districts. There was a significant difference in years of service for both medical examinations: those who answered "undetermined" had significantly shorter years of service than those who answered "impossible". Similar results were obtained regarding the years of experience of maternal and child

public health care.

With regard to work period in the current service, those who worked three years or longer answered "possible" more frequently for the 18-month medical examination and those who worked less than three years answered "undetermined" more frequently.

When the potential of screening for developmental

Table 5-1　Potentials of screening and relevant factors（attributes of public health nurses）

Item			18 months medical examination Potential of screening					3 years medical examination Potential of screening			
		n	Possible	Undetermined	Impossible	p Value	n	Possible	Undetermined	Impossible	p Value
Age [a] (years)	22-29	140	51 (36.4)	83 (59.3)	6 (4.3)	.015*	140	75 (53.6)	61 (43.6)	4 (2.8)	.810
	30-39	216	79 (36.6)	112 (51.8)	25 (11.6)		216	132 (61.1)	75 (34.7)	9 (4.2)	
	40-60	143	56 (39.2)	64 (44.8)	23 (16.0)		143	84 (58.7)	47 (32.9)	12 (8.4)	
Districts [b]	Special districts	81	47 (58.0)	27 (33.3)	7 (8.6)	<.001***	81	57 (70.4)	19 (23.5)	5 (6.1)	.005**
	Other cities	289	108 (37.4)	145 (50.1)	36 (12.5)		289	170 (58.8)	102 (35.3)	17 (5.9)	
	Towns and villages	129	31 (24.0)	87 (67.4)	11 (8.7)		129	64 (49.6)	62 (48.1)	3 (2.3)	
Years of service [c] (years)		499	10.0 (4.0-15.0)	9.0 (3.0-14.0)	12.0 (7.0-20.5)	.002**	499	10.0 (4.0-15.0)	9.0 (3.0-13.0)	13.0 (4.5-22.5)	.017*
			11.19 ± 8.11	9.59 ± 7.35	13.72 ± 8.47			11.00 ± 7.82	9.55 ± 7.50	14.28 ± 9.62	
					*					*	
Years of experience of maternal and child public health [d] (years)		492	6.0 (2.0-12.0)	5.0 (2.0-10.0)	7.0 (3.0-14.0)	.021*	492	6.0 (2.0-11.0)	4.0 (2.0-9.0)	9.5 (3.0-14.0)	.015*
			7.86 ± 6.79	6.60 ± 6.14	9.09 ± 7.19			7.71 ± 6.56	6.41 ± 6.24	9.83 ± 7.81	
Work period in the current service [e]	irregular	181	63 (34.8)	97 (53.6)	21 (11.6)	.043*	181	106 (58.6)	65 (35.9)	10 (5.5)	.829
	Less than three years	92	34 (37.0)	50 (54.3)	8 (8.7)		92	56 (60.9)	31 (33.7)	5 (5.4)	
(years)	Three years or longer	123	61 (49.6)	46 (37.4)	16 (13.0)		123	80 (65.0)	36 (29.3)	7 (5.7)	
Use of screening tools [f]	Yes	82	35 (42.7)	44 (53.7)	3 (3.6)	.065	93	57 (61.3)	31 (33.3)	5 (5.4)	.759
	No	417	151 (36.2)	215 (51.6)	51 (12.2)		406	234 (57.6)	152 (37.4)	20 (5.0)	

Notes. a,b,e,f ; Value are number（%）. P values denote the overall significance of differences between potential of screening for infant medical examinations by the chi-square test. c,d ; Upper row is median（inter quartile range）, lower row is mean ± SD（standard deviation）, p values denote the overall significance of differences between potential of screening for infant medical examinations the Kruskal-Wallis test, multiple comparison was conducted between undetermined and impossible by Bonferroni's test.
*p ＜ .05, **:p ＜ .01, *** p ＜ .001

Table 5-2　Potentials of screening and relevant factors（frequency of cooperation with relevant institutes）

Cooperation with relevant institutes			18 months medical examination Potential of screening				3 years medical examination Potential of screening			
		n	Possible	Undetermined	Impossible	p Value	Possible	Undetermined	Impossible	p Value
Treatment and education institutes	Frequently	248	113 (45.5)	116 (46.8)	19 (7.7)	<.001***	159 (64.1)	79 (31.9)	10 (4.0)	−
	Sometimes	169	49 (29.0)	99 (58.6)	21 (12.4)		82 (48.5)	76 (45.0)	11 (6.5)	
	Few	67	18 (26.9)	36 (53.7)	13 (19.4)		41 (61.2)	23 (34.3)	3 (4.5)	
Nursery schools	Frequently	244	99 (40.6)	115 (47.1)	30 (12.3)	−	151 (61.9)	80 (32.8)	13 (5.3)	−
	Sometimes	212	75 (35.4)	119 (56.1)	18 (8.5)		115 (54.3)	87 (41.0)	10 (4.7)	
	Few	35	8 (22.8)	22 (62.9)	5 (14.3)		19 (54.2)	15 (42.9)	1 (2.9)	
Kindergarten	Frequently	103	45 (43.7)	47 (45.6)	11 (10.7)	.571	71 (68.9)	29 (28.2)	3 (2.9)	.114
	Sometimes	200	75 (37.5)	102 (51.0)	23 (11.5)		112 (56.0)	75 (37.5)	13 (6.5)	
	Few	173	59 (34.1)	96 (55.5)	18 (10.4)		94 (54.4)	71 (41.0)	8 (4.6)	
Consultation office for children	Frequently	75	38 (50.7)	28 (37.3)	9 (12.0)	.084	52 (69.4)	19 (25.3)	4 (5.3)	−
	Sometimes	208	70 (33.6)	116 (55.8)	22 (10.6)		109 (52.4)	85 (40.9)	14 (6.7)	
	Few	199	72 (36.1)	105 (52.8)	22 (11.1)		122 (61.3)	71 (35.7)	6 (3.0)	
Specialized hospitals	Frequently	39	13 (33.3)	23 (59.0)	3 (7.7)	−	19 (48.7)	18 (46.2)	2 (5.1)	−
	Sometimes	195	80 (41.1)	96 (49.2)	19 (9.7)		118 (60.5)	70 (35.9)	7 (3.6)	
	Few	244	86 (35.2)	127 (52.0)	31 (12.8)		144 (59.1)	85 (34.8)	15 (6.1)	
Elementary schools	Frequently	29	11 (37.9)	13 (44.8)	5 (17.3)	−	19 (65.6)	7 (24.1)	3 (10.3)	−
	Sometimes	161	65 (40.3)	83 (51.6)	13 (8.1)		98 (60.9)	59 (36.6)	4 (2.5)	
	Few	287	103 (35.9)	151 (52.6)	33 (11.5)		164 (57.1)	107 (37.3)	16 (5.6)	

Notes.Value are number（%）. P values denote the overall significance of differences between potential of screening for infant medical examinations by the chi-square test. - : Unanalyzable because of the small number of public health nurses.
*** p ＜ .001

disorder were compared by the use or non-use of a screening tool, no relationship was observed for either medical examination.

2) Potentials of screening and relevant factors（frequency of cooperation with relevant institutes）（Table 5-2）

Regarding the potential of the 18-month medical examination, those who stated that they frequently cooperated with treatment and education institutes answered "possible" more frequently, whereas those who stated that there were few opportunities for cooperation answered "impossible" more frequently. For the 3-year medical examination, there was no such relationship.

3) Potentials of screening and relevant factors（difficulties felt by public health nurses）

（Table 5-3）

（1）Difficult situations for judgment during screening for infants with developmental disorder

In terms of difficult situations for judging developmental disorder during infant screening, "difficult intervention due to the lack of skills of public health nurses" was the most frequent response at 26.1%, followed by "impossible to evaluate accurate development due to environmental factors during the medical examination" such as a

noisy room at 24.8%, "tasks are feasible, but there is an unpleasant feeling about infant development in terms of the interpersonal relationship and behavioral aspects" at 19.0%, "inconsistency between guardians' information and impression of infant at the medical examination" at 16.8% and "problems of the family environment towards child rearing" at 8.2%.

Regarding the 18-month medical examination, those who answered "tasks are feasible, but there is an unpleasant feeling about infant development in terms of the interpersonal relationship and behavioral aspects" responded "undetermined" more frequently and "impossible" less frequently. For the 3-year medical examination, those who answered "difficult intervention due to the lack of skills of public health nurses" responded "impossible" more frequently to the potential of screening for developmental disorder.

（2）Influence of words and behavior of guardians on public health nurses

The behavior of guardians was influential in evaluating infant development for 96.2% of PHN. The most common behavior was "rejection of the instructions of public health nurses" at 69.5%. "There is no concern because tasks

Table 5-3　Potentials of screening and relevant factors（difficulties felt by public health nurses）

Difficulty feeling of public health nurses on screening	The whole n = 499	18 months medical examination Potential of screening				3 years medical examination Potential of screening			
		Possible n = 186	Undetermined n = 259	Impossible n = 54	p Value	Possible n = 291	Undetermined n = 183	Impossible n = 25	p Value
Difficult situations for judgment during screening for infants with developmental disorder									
Difficult intervention due to the lack of skills of public health nurses	130 (26.1)	46 (24.7)	65 (25.1)	19 (35.2)	.269	71 (24.4)	46 (25.1)	13 (52.0)	.011*
Impossible to evaluate accurate development due to environmental factors during the medical examination	124 (24.8)	46 (24.7)	67 (25.9)	11 (20.4)	.696	73 (25.1)	44 (24.0)	7 (28.0)	.902
Tasks are feasible, but there is an unpleasant feeling about infant development in terms of the interpersonal relationship and behavioral aspects	95 (19.0)	33 (17.7)	58 (22.4)	4 (7.4)	.033*	56 (19.2)	37 (20.2)	2 (8.0)	.341
Inconsistency between guardians' information and impression of infant at the medical examination	84 (16.8)	38 (20.4)	37 (14.3)	9 (16.7)	.232	55 (18.9)	24 (13.1)	5 (20.0)	.238
Problems of the family environment towards child rearing	41 (8.2)	24 (12.9)	15 (5.8)	2 (3.7)	−	30 (10.3)	10 (5.5)	1 (4.0)	−
Refusal of guardians strong	22 (4.4)	15 (8.1)	5 (1.9)	2 (3.7)	−	18 (6.2)	3 (1.6)	1 (4.0)	−
Influence of words and behavior of guardians on public health nurses									
Rejection of the instructions of public health nurses	347 (69.5)	136 (73.1)	175 (67.6)	36 (66.7)	.404	207 (71.1)	122 (66.7)	18 (72.0)	.567
There is no concern because tasks are feasible at home	247 (49.5)	90 (48.4)	132 (51.0)	25 (46.3)	.765	140 (48.1)	93 (50.8)	14 (56.0)	.679
There is no obstacle in leading daily life	225 (45.1)	74 (39.8)	133 (51.4)	18 (33.3)	.011*	129 (44.3)	88 (48.1)	8 (32.0)	.292
Guardians are sick	131 (26.3)	49 (26.3)	66 (25.5)	16 (29.6)	.819	75 (25.8)	47 (25.7)	9 (36.0)	.524
Slow development is fine	112 (22.4)	36 (19.4)	65 (25.1)	11 (20.4)	.333	57 (19.6)	51 (27.9)	4 (16.0)	.080
Indifference to children	90 (18.0)	34 (18.3)	43 (16.6)	13 (24.1)	.428	55 (18.9)	31 (16.9)	4 (16.0)	−
Guardians lack of knowledge about developmental disorder	73 (14.6)	30 (16.1)	31 (12.0)	12 (22.2)	.117	46 (15.8)	23 (12.6)	4 (16.0)	−
No suggestion at the nursery schools	68 (13.6)	29 (15.6)	31 (12.0)	8 (14.8)	.527	41 (14.1)	23 (12.6)	4 (16.0)	−

Notes.Value are number（%）. P values denote the overall significance of differences between potential of screening for infant medical examinations by the chi-square test, - : Unanalyzable because of the small number of public health nurses.
* p ＜ .05

are feasible at home" accounted for 49.5% of responses, whereas "there is no obstacle in leading daily life" accounted for 45.1%, which might be interpreted as the rejection of a problem by guardians. These words were influential on the judgment made by PHN.

Regarding the 18-month medical examination, those who answered "there is no obstacle in leading daily life" were more frequently "undetermined" about the potential of the screening to identify developmental disorder.

Discussion

The results of this study showed that PHN consider that the primary aim of the current infant medical examinations is the early detection of delayed infant development at both infant medical examinations. In addition, it was thought that a small proportion of respondents answered "impossible" regarding the potential of screening for developmental disorder and the potential of the screening was not denied. However, a large proportion of subjects answered "undetermined" for both infant medical examinations, which indicated the awareness of PHN towards the difficulty and problems in screening for infant developmental disorder at both medical examinations. Therefore, the potential of the screening and its related factors were discussed.

Those who answered that screening is "possible" at both medical examinations more frequently worked in the special districts. Regarding the 18-month medical examination, those who had worked for three years or a longer work period in the current service and those who cooperated well with "treatment and education institutes" more frequently answered "possible". Our previous study demonstrated that cooperation was more structured in urban areas, and districts with treatment and education institutes for infants with developmental disorder had a higher follow-up rate after medical examination [13]. These results suggested that PHN in urban areas were in an environment where cooperation with treatment and education institutes was easier and where there were more opportunities to confirm their judgment and learn practical support methods. It was presumed that differences in the working environment influenced the awareness of PHN towards the screening. Working for a long work period in the current service seemed to enhance the judgment ability of PHN due to not only their accumulation of experience but also their increased

opportunities to confirm their own results of the screening. Conversely, those who answered "undetermined" for the 18-month examination worked more frequently in the towns and villages, and they were mostly in their 20s, had shorter years of service, worked for less than three years work period in the current service and rarely cooperated with treatment and education institutes. It was presumed that young and less-experienced PHN had difficulties in the screening under circumstances in which there were few opportunities to learn from experts. Therefore, although they noticed a developmental disorder, they failed to collect sufficient information from guardians and so they frequently answered "tasks are feasible, but there is an unpleasant feeling about infant development in terms of the interpersonal relationship and behavioral aspects" and "there is no obstacle in leading daily life".

Those who answered that the screening was "impossible" at both medical examinations had worked longer years. Regarding the 3-year medical examination, a number of respondents felt the difficulty with their knowledge and skills, and answered "difficult intervention due to the lack of skills of public health nurses". These results suggested that they failed to establish confidence in screening for infant developmental disorder during their long experience as a public health nurse alone.

The rate of using a screening tool was markedly low, and there was no relationship between responses to the potential of the screening and the use of a screening tool. As Rutter et al [16], previously mentioned, tools for diagnosis of a pervasive developmental disorder greatly depend on the specialty of the examiner, and it is important for the examiner to have sufficient expert knowledge. Therefore, sufficient knowledge and technique are necessary for using such tools. Because infant behavioral development shows interpersonal differences and varying patterns, however, it should be evaluated according to the level of development of the infant [17]. Takano et al [18] reported that health check-ups on infant development and psychological status were carried out in 84.0% of municipalities in Japan, and an interview was used as the content of the health check-ups in 80.8% of cases. A screening tool was also used in markedly low proportions in the present study. It was thought that preexisting tools are aimed at diagnosing infant developmental disorder and are not suitable for screening at the infant medical examinations. The PHN that did not use a screening tool evaluated

infant developmental disorder by observation of tasks for infants and their behavior during the short period of the medical examination and by questionnaires for guardians. They failed to collect sufficient information and make judgments with confidence, even though they might feel unpleasant for the screening. Therefore, to support the awareness of PHN the development of a simple tool in addition to seminars to brush up interventional techniques are required.

With regard to the early detection and support of developmental disorder in other countries, individual support should be provided for infants from an early stage, even in cases without a definitive diagnosis, according to guidelines for screening for developmental disorder by the American Academy of Pediatrics in the United States. [19] In addition, education for infants with disability was stipulated by the IDEA [20] , and individual family support plans are implemented until the age of two. In Finland, frequent medical examinations are provided free of charge two years of age [21] for early detection and support.

Recently, attention has been increasingly focused on the 5-year medical examination in Japan. Considering the characteristics of developmental disorder, it is most important to detect it and provide support as early as possible, even though diagnosis may be unreliable. Therefore, the current systems should be reviewed so that the screening at the medical examinations at the two age groups currently carried out in Japan will effectively function and lead to support. Due to the nature of mass screening, it is difficult to spend sufficient time on each individual, and it is important to collect necessary information in advance from nursery schools and strengthen the cooperation with relevant institutes. Moreover, it is necessary to consider a screening tool to support the awareness of developmental screening.

The present study has a few limitations. First, sampling bias may have occurred because the participants were recruited at a few municipalities in Japan. Second, because of the low response rate, there is a limit to the generalization of the results. Nevertheless, the study has shown that to detect infants with a developmental disorder early, it is critical to structure the systems of medical examination, to develop a screening tool, to reinforce seminars to improve knowledge and skills related to developmental disorder, and to make the best use of opportunities for cooperation with relevant

institutes.

Conclusion

Awareness of PHN towards screening for developmental disorder at infant medical examinations and related factors were investigated.

1. Those who answered that screening for infant developmental disorder was "undetermined" at the 18-month medical examination accounted for 51.9% of responses, while those who answered "possible" at the 3-year medical examination accounted for 58.3%.

2. Regarding the screening for infants with developmental disorder at the infant medical examinations, those who used a screening tool accounted for only 16.4% at the 18-month medical examination and also only 18.6% at the 3-year medical examination, and there was no relationship between using a screening tool and responses to the potential of the screening.

3. When the potential for the early detection of developmental disorder was compared among the districts, those who answered "possible" at both medical examinations accounted for a significantly larger proportion of respondents in the special districts, and cooperation with treatment and education institutes and nursery schools was well established in these districts.

4. Regarding the 18-month screening, those who answered "possible" to screen for infant developmental disorder had more frequently worked three years or a longer work period in the current service and PHN in their 20s answered "undetermined" more frequently. For the 3-year medical examination, those who worked longer years and had longer experience of maternal and child public health care more frequently answered "impossible" regarding the screening.

5.Those who answered "undetermined" regarding the potential of screening also answered "tasks are feasible, but there is an unpleasant feeling about infant development in terms of the interpersonal relationship and behavioral aspects" more frequently for the 18-month medical examination, while those who answered "difficult intervention due to the lack of skills of public health nurses" more frequently answered "impossible" regarding the potential of the screening at the 3-year medical examination.

Acknowledgment

We would like to thank deeply all of the public health nurses and the municipal health centers who cooperated in carrying out this study.

References

1) Nakamura T: The present conditions of the infants medical examination and future problem, Current Information of Maternal & Child Health 58: 51-58, 2008 (in Japanese)

2) Matuyama Y, Hiraiwa M : Infants medical examination and Discovery of the abuse, The Journal of Pediatric practice 68（2）: 221-226, 2005（in Japanese）

3) Ministry of Health, Labour and Welfare: Developmental Disabilities Assistance Act（in Japanese） http://www.mhlw.go.jp/stf/seisakunitsuite/bunya/ hukushikaigo/shougaishahukushi/hattatsu/index.html （December.24.2013.）

4) Koeda T, Simoizumi H, etal: Manual of awareness and support for children with developmental disabilities mild, Ministry of Health, Labour and Welfare Grant-in-Aid for Scientific Research report,2006（in Japanese） http://www.mhlw.go.jp/bunya/kodomo/boshi-hoken07/ （December.24.2013）

5) Ministry of Education, Culture, Sports, Science and Technology・Japan : Survey results for students in need of special educational support of a possible developmental disabilities enrolled in regular classes, 2013（in Japanese） http://www.mext.go.jp/a_menu/shotou/tokubetu/ material/1328729.htm（December.24.2013）

6) Saitou K, Iwadaru Y: The secondary failure in mild developmental disorder, The Japanese journal of child nursing 30（9）: 1267-1273, 2007（in Japanese）

7) Sugiyama T: Developmental disorders fourth of child abuse. Human Care Book of Gakken : pp 9-21, 2007 （in Japanese）

8) Hosokawa T, Honma H: It's features and actual abuse of children with disabilities in our country（Child and Family Integrated Research Business）2001 research report, 382-390, 2002（in Japanese）

9) Sugiyama T: Developmental differentiations and maltreatment of children. Journal of Japanese Society of Child Health Nursing 20（3）, 103-107, 2011（in Japanese）

10) Johnson CP, Myers SM: American Academy of Pediatrics Council on Children With Disabilities, Identification and evaluation of children with autism spectrum disorders, Pediatrics 120: pp 1183-1215, 2007

11) Munakata T, Umezu A, Munehisa T, et al :Study on early detection and support programs for developmental disabilities in foreign countries-Focusing on programs in the U.S.U.K. and Finland-National Insutitute of special needs education-: 17-45, 2010（in Japanese）

12) Saitou S, Takano A: A Survey on Parents' Cognition of Maternal and Child Health Services, 41st Collection Japan Child and Family Research Institute Bulletin : 219-224, 2005（in Japanese）

13) Inaba F, Kimura R, Tsuda A, et al: Investigation about early detection and the intervention of the Developmental Disorder child in the infant Medical Examination. Journal of The Tsuruma Health Science Society, Kanazawa University 35（2）: 51-61, 2011（in Japanese）

14) Hiraiwa M: 5-year-old infant medical examination and early detection of developmental disorders , The Japanese Society of Child Health: 41-45, 2009（in Japanese）

15) Landa R:Diagnosis of autism spectrum disorders in the first 3 years of life.Nat Clin Pract Neurol:pp138-147,2008

16) Rutter M, LeCouteur A, LordC,etal: Diagnosis and subclassific ation of autism: Concepts and instrument development. In:（eds）, Schopler ,E. and Mesibov , G. Diagnosis and Assessment in Autism. Plenum, New York, pp 239-259, 1988

17) Maekawa K: Infants medical examination in the future.-To health-oriented from disease-oriented- The Journal of Child Health 59（3）: 387-394, 2000（in Japanese）

18) Takano A : The research results on early screening and support of developmental disorders related to infant medical examination. -Health, Labor and Welfare scientific research, such as recent and relevant laws and regulations-: 14-25, 2009（in Japanese）

19) Committee on Children With Disabilities, American Academy of Pediatrics（2006）. Identifying infants and young children with developmental disorders in the medical home: An algorithm for developmental surveillance and screening. Pediatrics,118（1）,405-420

20) Individuals with Disabilities Education Act（IDEA):Analysis of Changes Made by P.L. 108-446

21) Ministry of Social Affaires and Health 2006 Maternity and child welfare clinics. http://www.stm.fi/Resource.phx/eng/subjt/famil/fpoli/ maternityclinic.htx（May.1.2014.）

幼児健診における発達障害児のスクリーニングに関する
保健師の認識と関連要因

稲葉　房子 *,***, 木村　留美子 **, 津田　朗子 **

要　　旨

　近年、発達障害児の増加に伴い、幼児健診における発達障害の早期発見に期待が寄せられているにもかかわらず、3歳児健診以降に発達障害を疑われる子どもが多く発見されている。

　そこで、本研究では発達障害児の早期発見を目的としたスクリーニングに関する保健師の認識と関連要因を明らかにするために、母子保健に携わっている保健師499名（回収率26.3％）を対象に自記式質問紙を用いて調査したので報告する。

　発達障害児のスクリーニングを「可能」と回答した者は、18か月児健診では37.3％、3歳児健診では58.3％と3歳の方が有意に高く、「どちらともいえない」と回答した者は、18か月児健診で51.9％、3歳児健診では36.7％と18か月の方が有意に高かった。スクリーニングにツールを活用している割合は18か月児健診では16.4％、3歳児健診では18.6％と極めて少なく、ツールの活用とスクリーニングの可能性との関連はみられなかった。設置主体別に発達障害の早期発見の可能性を比較すると、いずれの健診も「可能」と回答した割合は特別区・政令市に有意に高く、療育機関や保育園の関連機関との連携もよく行われていた。18か月児健診では、発達障害児のスクリーニングを「可能」と回答した者は母子保健担当業務を変更する周期が3年以上の者に多かった。「どちらともいえない」と回答した者は、20代の保健師に多かった。3歳児健診でスクリーニングが「不可能」と回答した者は、勤務年数と母子保健経験年数の長い者に多かった。