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Relationship between social capital and disaster preparedness in parents raising infants

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ABSTRACT

In disaster situations, infants must rely on their parents to evacuate appropriately, and the status of disaster preparedness of parents greatly affects outcomes. Although social capital is effective in promoting disaster preparedness, no reports have investigated the association between social capital and disaster preparedness for evacuations in parents raising infants. Therefore, we investigated the association between social capital and disaster preparedness among parents raising infants to contribute to policies for reducing the risk to infants during future disasters. We conducted a cross-sectional questionnaire study of 1,166 parents raising 3-year-old infants in southern Okinawa Prefecture from May to August 2015. A self-administered questionnaire was used to collect information on parents' basic sociodemographic attributes, disaster preparedness and social cohesion. Disaster preparedness was assessed with the following four items: discussion amongst the local residents regarding disaster evacuation, having a disaster prevention map of the area, previous participation in disaster evacuation drills, and having an emergency kit. Social capital was assessed using the Japanese version of the Social Cohesion Scale and interactions with other parents. The χ^2 test and binomial logistic regression analysis were conducted to analyze the association between the four disaster preparedness items and the other items. $P < 0.05$ was considered statistically significant. Valid responses were collected from 810 parents (70 men (8.6%) and 740 women (91.4%)). Social cohesion was high in 421 parents (52.0%) and low in 389 parents (48.0%). Participation in disaster evacuation drills showed the lowest level of disaster preparedness with only 5.4% of parents partaking in such drills. Regression analysis showed that discussion regarding disaster evacuation was significantly different for satisfaction with income, social cohesion, and interactions with other parents. The status of possession of disaster prevention map was significantly varied depending on age, age of first child, education, and interactions with other parents. The status of participation in evacuation drills was significantly varied depending on sex, satisfaction with income, and interactions with other parents. Having an emergency kit was significantly different for satisfaction with income, education, occupational status, and interactions with other parents. From these result, the status of disaster preparedness for evacuation in parents raising infants was associated with social capital. The results suggest that disaster prevention education using the standards and networks of others who are engaged in child rearing is useful in strengthening the disaster preparedness of parents raising infants. *Ryukyu Med. J., 38 (1~4) 47~60, 2019*

Key words: disaster preparedness, infant, parents, social capital

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INTRODUCTION

The Great East Japan Earthquake led to re-emergence in the recognition of the necessity and significance of disaster prevention education with regards to natural disasters. For example, the United Nations established the “Sendai Framework for Disaster Risk Reduction 2015–2030,” emphasizing how important it is for all members of society, including civil society and volunteers, to be involved in disaster prevention¹.

To prepare for large-scale disasters, habitual initiatives must be undertaken to improve the disaster prevention capabilities of residents. To achieve this, it is necessary to enhance disaster prevention awareness among residents and to provide proper education for understanding the current situation. However, in general, residents are not adequately aware of how to proactively face disaster risks and prepare for a disaster²⁻⁵.

After Hurricane Katrina in the United States, over 5000 children escaped from their homes or were separated from their families⁶. In addition, the hurricane and subsequent disaster situation greatly affected families with children under the age of 18⁷. Based on the lessons learned from the 2011 earthquake and tsunami in Japan, having an effective plan and high level of preparation play an important role in saving children’s lives⁸. In a study of individuals who experienced floods in South India, Krishna et al. reported that the lack of preparation by the residents resulted in child victims of flooding⁹. Infants need special care during a disaster^{10, 11} and their lives may be in danger depending on the level of disaster preparedness of their parents/guardians, especially their preparedness concerning evacuation. Thus, in the process of promoting measures to prevent a disaster from expanding, it is necessary to focus on disaster preparedness regarding evacuation in families raising infants.

The United States Federal Emergency Management Agency (FEMA) introduced a campaign to promote individual disaster preparedness in four steps¹². The first step, called “Be Informed,” indicates knowing the disaster risks in one’s residential area and participating in disaster prevention drills. Kohn et al. reported that an individual’s disaster preparedness is largely divided into the preparation

of consumable goods in the event of an emergency (or an emergency kit) and the development of a family emergency plan; however, they also stated that a variety of measurement tools are used and there is no standard definition of disaster preparedness¹³. The Japanese Disaster Countermeasures Basic Act specifies residents’ duties to include participation in disaster prevention drills and other voluntary disaster prevention activities, and the Japanese government promotes the preparation of an emergency bag and confirmation of an evacuation site and route as a form of disaster preparedness.

Age, sex, race, income, education, and previous disaster experience are relevant factors in disaster preparedness¹⁴, and many of the disaster preparedness investigations that have focused on children have focused on those with special health care needs¹⁵⁻¹⁷. However, a population approach that includes the overall population of children in a community is necessary from a public health perspective. Moreover, the Disaster Countermeasures Basic Act stipulates that the measures required to limit the damage incurred in a disaster be considered, and it specifies individuals such as the elderly, disabled, and infants as those requiring particular consideration. What these individuals have in common is that they have a limited ability to evacuate during a disaster and would have difficulty adapting to life in an evacuation center during the emergency phase of a disaster¹⁸. The elderly and disabled in particular have been designated as requiring evacuation assistance, guidelines for evacuation assistance have been provided, and many studies have been conducted in this area¹⁹⁻²¹. Moreover, very few studies have focused on the case of families raising infants²².

Social capital is an aspect of life that has been gaining attention for its association with residents in the event of a natural disaster, primarily with the psychological health of residents affected by a disaster²³⁻²⁵. Social capital is a key element composing the regional capacity to resolve problems within a community and is known to express characteristics of a social organization such as trust, standards, and networks²⁶. A high level of social capital has been shown to potentially affect health-related activities by rapidly spreading health information and by implementing social management against deviant behavior²⁷. Based on

these facts, it has been postulated that fostering social capital is effective in promoting activities of disaster preparedness, and this has consequently led to the development of several studies²⁸⁻³⁰.

A case study of rural Japanese communities reported that social capital is an important element in strengthening disaster management²⁸. Hoffmann and Mutarak conducted a study of residents in the Philippines and Thailand, the countries known for frequent natural disasters, and found that a high level of social capital promotes disaster preparations³¹. A health survey conducted on residents afflicted by the Great East Japan Earthquake showed that although disaster preparedness decreased annually after the event, having community ties is a key factor in maintaining disaster preparedness³². However, we found no reports investigating the association between social capital and habitual disaster preparedness for evacuations in parents raising infants who cannot make decisions or evacuate on their own during a disaster.

By ascertaining the level of disaster preparedness for evacuation in parents raising infants, who especially require care and assistance for evacuation when a disaster occurs, and by providing support to these parents, it may be possible to minimize damage in the event of a disaster. Although it is difficult to prevent the occurrence of disasters, it is feasible within a framework of public health measures to provide support to individuals so that they can make arrangements towards disaster preparedness and contribute to the disaster prevention capabilities of community residents by utilizing social capital. Thus, the purpose of the present study was to investigate the association between social capital and disaster preparedness among parents raising infants, and to contribute to policies for reducing the risk to infants during disasters that may occur in the future.

METHODS

Participants

We used a self-reported questionnaire on the health of parents raising infants and the factors associated with parents' health. In this cross-sectional study, in order to conduct a survey on

parents raising infants, we requested the cooperation of local municipality divisions responsible for the health of infants in southern Okinawa Prefecture to recruit participants. Health checkups are conducted on infants aged 0 years old, 18 months old, and 3 years old at health agencies of local municipalities. After coordinating with the personnel responsible for conducting infant health checkups and taking the waiting time for checkups, space within the checkup venue, and ease of obtaining questionnaire responses into consideration, we included parents of children receiving the 3-year-old health checkup in the present study.

Nine local municipalities agreed to participate in this survey, which was conducted between May and August 2015. An anonymous self-administered questionnaire was distributed to 1,166 parents who visited the participating health agencies for their children's checkups. Completed questionnaires were collected from 964 parents (response rate: 82.7%).

Ultimately, 810 parents who did not have any omissions in the analysis items, such as sex, age, disaster preparedness, and social capital were included in the final analysis.

Disaster Preparedness

The Disaster Countermeasures Basic Act defines the term "disaster" as "damage caused by a storm, tornado, heavy rainfall, heavy snowfall, flooding, slope failure, mudflow, high tide, earthquake, tsunami, eruption, landslide, or other abnormal natural phenomena, or a large-scale fire or explosion, or any other damage of similar extent originating from a cause specified by the Cabinet Order." In the present study, "disaster" was defined as "a natural hazard such as typhoon, concentrated heavy rain, flooding, earthquake, tsunami, or drought."

Since infants cannot ascertain the situation and evacuate appropriately on their own, the evacuation preparedness of their parents in the event of a disaster greatly impacts the outcome. Various studies have investigated individuals' disaster preparedness, and these studies utilize content appropriate to the respective study's purpose¹³. In the present study, respondents were asked to answer with either "yes" or "no" to the following items regarding disaster preparedness, which were created based on the Japanese Disaster Countermeasures Basic Act: "There is discussion

amongst the local residents regarding disaster evacuation (Discussion),” “I have a disaster prevention map of the area (Prevention map),” “I have previously participated in disaster evacuation drills conducted in the area (Evacuation drills),” and “I have a bag prepared to take in the event of a disaster (Emergency kit).”

Social capital

In this study, social capital was assessed by social cohesion and interactions with other parents.

Social cohesion: Social cohesion was assessed using the social cohesion subscale of the Neighborhood Scales developed by Mujahid, Roux, Morenoff and Raghunathan³³. The validity of the Japanese version of the social cohesion subscale was verified by Ooga, Oomori, Kondo and Oyama³⁴. In the social cohesion subscale, respondents are required to rate the following four statements on a five-step scale from “strongly agree” to “strongly disagree”: “People around here are willing to help their neighbors,” “People in my neighborhood generally get along with each other,” “People in my neighborhood can be trusted,” and “People in my neighborhood share the same values”. The responses were scored, and those with a median score of 12 or less were classified into the low social cohesion group, and those scoring 13 or more were classified into the high social cohesion group.

Interactions with other parents: It has been indicated in recent years that people often acquire everyday information through conversation with friends and acquaintances or other verbal methods other than mass communication³. We therefore postulated that interactions, specifically among friends acquainted through child rearing may be useful as a social management function for families raising infants. In the present study, we investigated the interactions with friends acquainted through child rearing and the relationship with neighbors as a type of social capital at the individual level of parents raising infants.

Regarding interactions with parents raising children or asking for advice on child rearing in the past year, respondents were asked to select “yes” or “no” to the statement “I have interactions with people I became friends with through childbirth and childrearing (interactions with other parents).”

Sociodemographic attributes

The basic sociodemographic attributes of respondents collected were as follows: age, sex,

number of children, age of first child, marital status, occupational status, housing, time living in the current area of residence, education level and satisfaction with income. The respondent’s age, number of children and age of first child were answered in numbers and were categorized for analyses. In this analysis, we classified the age of the first child into two groups of six years old and younger and seven years old and older based on school age. Occupational status was either “employed” or “unemployed.” Highest education level was divided into “under high school diploma” and “college degree or higher.” Marital status was either “married” or “single (divorced/widowed/unmarried)”. Satisfaction with income was assessed by the question “Are you satisfied with your current household income?” and rated on four levels from “very satisfied” to “unsatisfied.” “Very satisfied” and “somewhat satisfied” were classified as “satisfied” and “not very satisfied” and “unsatisfied” were classified as “unsatisfied.”

Analytic strategy

Simple tabulations were performed for the respondent’s basic sociodemographic attributes, and the χ^2 test was used to analyze the association between the four items on disaster preparedness and other items. To further assess the association between each of the four items on disaster preparedness and other items, binomial logistic regression analysis was conducted with items on disaster preparedness as dependent variables, items that showed a significant difference on the χ^2 test as independent variables. Data processing and analysis were conducted using SPSS ver.23 for Windows. $P < 0.05$ was considered statistically significant in the present study.

Ethical considerations

This study was conducted with the approval of the Ethics Committee of the University of the Ryukyus. The participants received oral and written explanations of the study purpose, methods, voluntary nature of participation, that they were free to withdraw from the study at any time without penalty, and that they did not need to answer any questions if they found these questions difficult. The participants completed the questionnaire forms and then placed them in a collection box at the facility.

RESULTS

Respondent characteristics

Eight hundred and ten respondents without missing items were analyzed. Participant characteristics are shown in Table 1. There were 70 men (8.6%) and 740 women (91.4%). There were 143 participants (17.7%) in their 20s, 511 (63.1%) in their 30s, and 156 (19.3%) in their 40s. Marital status was married in 754 parents (93.1%) and single in 56 parents (6.9%). The highest level of education was

Table 1 Characteristics of the participants

Variables	n	(%)
Sex		
Men	70	(8.6)
Women	740	(91.4)
Age (years)		
20–29	143	(17.7)
30–39	511	(63.1)
≥ 40	156	(19.3)
Marital status		
Married	754	(93.1)
Single	56	(6.9)
Education		
Under high school diploma	286	(35.3)
College degree or higher	524	(64.7)
Occupational status		
Employed	594	(73.3)
Unemployed	216	(26.7)
Number of children		
1	142	(17.5)
2	361	(44.6)
≥ 3	307	(37.9)
Age of first child (years)		
≤ 6	519	(64.1)
≥ 7	291	(35.9)
Housing		
Housing complex	604	(74.6)
Detached house	206	(25.4)
Time living in current area of residence (years)		
≤ 2	204	(25.2)
3–5	281	(34.7)
≥ 6	325	(40.1)
Satisfaction with income		
Satisfied	552	(68.1)
Unsatisfied	258	(31.9)
Social cohesion		
High	421	(52.0)
Low	389	(48.0)
Interactions with other parents		
Yes	491	(60.6)
No	319	(39.4)

Note: n=810.

under high school diploma in 286 parents (35.3%) and college degree or higher in 524 parents (64.7%). Occupational status was employed in 594 parents (73.3%) and unemployed in 216 parents (26.7%). The number of children was one in 142 parents (17.5%), two in 361 parents (44.6%), and three or more in 307 parents (37.9%). The age of the oldest child was six or younger in 519 parents (64.1%) and seven or older in 291 parents (35.9%). The type of residence was a housing complex in 604 parents (74.6%) and a detached house in 206 parents (25.4%). The length of time living in the current area of residence was 2 years or shorter in 204 parents (25.2%), 3–5 years in 281 parents (34.7%), and 6 years or longer in 325 parents (40.1%). Satisfaction with income was satisfied in 552 parents (68.1%) and unsatisfied in 258 parents (31.9%).

Social cohesion was high in 421 parents (52.0%) and low in 389 parents (48.0%). The question on interactions with other parents was answered “yes” by 491 parents (60.6%) and “no” by 319 parents (39.4%).

Disaster preparedness

One hundred and five parents (13.0%) responded “yes” to “There is discussion amongst the local residents regarding disaster evacuation” (Table 2). Two hundred and one parents (24.8%) responded “yes” to “I have a disaster prevention map of the area.” Forty-three parents (5.4%) responded “yes” to “I have previously participated in disaster evacuation drills conducted in the area.” One hundred and six parents (13.1%) responded “yes” to “I have a bag prepared to take in the event of a disaster.”

Table 2 Status of disaster preparedness in parents raising infants

Variable		n	(%)
There is discussion amongst the local residents regarding disaster evacuation	Yes	105	(13.0)
	No	705	(87.0)
I have a disaster prevention map of the area	Yes	201	(24.8)
	No	609	(75.2)
I have previously participated in disaster evacuation drills conducted in the area	Yes	43	(5.3)
	No	767	(94.7)
I have a bag prepared to take in the event of a disaster	Yes	106	(13.1)
	No	704	(86.9)

Note: n=810.

Association between disaster preparedness and other items

The association between the four items on disaster preparedness and other items was investigated by examining the distributions (Table 3). Relationships were seen between interactions with other parents and all four items on disaster preparedness, and many of those who engaged in such interactions also engaged in disaster preparedness. Moreover, 17.8% of participants in the group high in social cohesion discussed disasters

with their neighbors, which was significantly higher than the proportion who did so in the group low in social cohesion (7.7%). Among the items related to the demographics of the parents, a significant relationship was seen between educational level and whether they had a disaster-prevention map or emergency kit. Of those with an educational level of junior college or higher, 30.0% had a disaster-prevention map, while this was true of 13.4% of those with a lower level of education. Moreover, 15.1% of those with an educational level of junior

Table 3 Association between disaster preparedness, demographics and social capital

Variables	Total	Discussion n (%)	P value	Prevention map n (%)	P value
Sex					
Men	70	11 (15.7)	0.473	18 (25.7)	0.855
Women	740	94 (12.7)		183 (24.7)	
Age (years)					
20–29	143	11 (7.7)	0.084	13 (9.1)	<0.001
30–39	511	69 (13.5)		132 (25.8)	
≥ 40	156	25 (16.0)		56 (35.9)	
Marital status					
Married	754	98 (13.0)	0.915	192 (25.5)	0.116
Single	56	7 (12.5)		9 (16.1)	
Education					
Under high school diploma	286	35 (12.2)	0.650	44 (15.4)	<0.001
College degree or higher	524	70 (13.4)		157 (30.0)	
Occupational status					
Employed	594	72 (12.1)	0.237	144 (24.2)	0.532
Unemployed	216	33 (15.3)		57 (26.4)	
Number of children					
1	142	14 (9.9)	0.258	20 (14.1)	0.003
2	361	54 (15.0)		93 (25.8)	
≥ 3	307	37 (12.1)		88 (28.7)	
Age of first child (years)					
≤ 6	519	59 (11.4)	0.071	100 (19.3)	<0.001
≤ 7	291	46 (15.8)		101 (34.7)	
Housing					
Housing complex	604	75 (12.4)	0.428	141 (23.3)	0.097
Detached house	206	30 (14.6)		60 (29.1)	
Time living in current area of residence (years)					
≤ 2	204	33 (16.2)	0.196	37 (18.1)	0.002
3–5	281	37 (13.2)		63 (22.4)	
≥ 6	325	35 (10.8)		101 (31.1)	
Satisfaction with income					
Satisfied	552	81 (14.7)	0.034	147 (26.6)	0.080
Unsatisfied	258	24 (9.3)		54 (20.9)	
Social cohesion					
High	421	75 (17.8)	<0.001	121 (28.7)	0.007
Low	389	30 (7.7)		80 (20.6)	
Interactions with other parents					
Yes	491	78 (15.9)	0.002	141 (28.7)	0.001
No	319	27 (8.5)		60 (18.8)	

Note: n=810. Chi-squared test, Discussion: There is discussion amongst the local residents regarding disaster evacuation, Prevention map: I have a disaster prevention map of the area

college or higher had an emergency kit, while 9.4% of those with a lower level of education had such a kit, a significant difference. Significant relationships also were seen between satisfaction with income and whether the participants talked with neighbors, participated in evacuation drills, and had an emergency kit. Of those who were satisfied with their income, 14.7% talked with neighbors, while 9.3% of those dissatisfied with their income did so, a significant difference. Of the participants who were satisfied with their income, 6.7% participated in

evacuation drills, while 2.7% of the participants who were dissatisfied with their income participated. Thus, significantly more participants who were satisfied with their income participated. Regarding emergency kits, 16.3% of those who were satisfied with their income said they possessed one, while 6.2% of those who were dissatisfied with their income said they did. Thus, significantly more individuals who were satisfied with their income possessed an emergency kit.

Logistic regression analysis was conducted

Table 3 Association between disaster preparedness, demographics and social capital (continued)

Variables	Total	Evacuation drills n (%)	P value	Emergency kit n (%)	P value
Sex					
Men	70	8 (11.4)	0.017	9 (12.9)	0.953
Women	740	35 (4.7)		97 (13.1)	
Age (years)					
20–29	143	5 (3.5)	0.567	19 (13.3)	0.226
30–39	511	29 (5.7)		73 (14.3)	
≥ 40	156	9 (5.8)		14 (9.0)	
Marital status					
Married	754	39 (5.2)	0.526	101 (13.4)	0.339
Single	56	4 (7.1)		5 (8.9)	
Education					
Under high school diploma	286	12 (4.2)	0.297	27 (9.4)	0.023
College degree or higher	524	31 (5.9)		79 (15.1)	
Occupational status					
Employed	594	29 (4.9)	0.369	69 (11.6)	0.040
Unemployed	216	14 (6.5)		37 (17.1)	
Number of children					
1	142	4 (2.8)	0.328	17 (12.0)	0.362
2	361	22 (6.1)		54 (15.0)	
≥ 3	307	17 (5.5)		35 (11.4)	
Age of first child (years)					
≤ 6	519	26 (5.0)	0.612	71 (13.7)	0.503
≥ 7	291	17 (5.8)		35 (12.0)	
Housing					
Housing complex	604	31 (5.1)	0.702	83 (13.7)	0.344
Detached house	206	12 (5.8)		23 (11.2)	
Time living in current area of residence (years)					
≤ 2	204	8 (3.9)	0.232	30 (14.7)	0.667
3–5	281	20 (7.1)		37 (13.2)	
≥ 6	325	15 (4.6)		39 (12.0)	
Satisfaction with income					
Satisfied	552	36 (6.5)	0.024	90 (16.3)	<0.001
Unsatisfied	258	7 (2.7)		16 (6.2)	
Social cohesion					
High	421	26 (6.2)	0.252	62 (14.7)	0.150
Low	389	17 (4.4)		44 (11.3)	
Interactions with other parents					
Yes	491	33 (6.7)	0.026	85 (17.3)	<0.001
No	319	10 (3.1)		21 (6.6)	

Note: n=810. Chi-squared test, Evacuation drills: I have previously participated in disaster evacuation drills conducted in the area, Emergency kit: I have a bag prepared to take in the event of a disaster.

with each item on disaster preparedness as the dependent variable and items that were statistically significant with simple correlation analysis as explanatory variables. Table 4 shows the results of the logistic regression analysis.

“There is discussion amongst the local residents regarding disaster evacuation” was significantly

associated with social cohesion (adjusted odds ratio, AOR=2.34, 95% confidence interval, CI=1.48–3.68) and interactions with other parents (AOR=1.72, 95% CI=1.07–2.76).

“I have a disaster prevention map of the area” was significantly associated with first child being 7 years old or older (AOR=1.82, 95% CI=1.18–2.80),

Table 4 Odds ratios and confidence intervals for disaster preparedness

Variables	Discussion			Prevention map			Evacuation drills			Emergency kit		
	AOR	95% CI	P value	AOR	95% CI	P value	AOR	95% CI	P value	AOR	95% CI	P value
Sex												
Women	—			—			0.33	0.14–0.748	0.008	—		
Man	—			—			1.00			—		
Age												
≥ 40	—			3.43	1.70–6.918	0.001	—			—		
30–39	—			2.52	1.35–4.716	0.004	—			—		
20–29	—			1.00			—			—		
Education												
College degree or higher	—			1.96	1.32–2.92	0.001	—			1.45	0.90–2.34	0.125
Under high school diploma	—			1.00			—			1.00		
Occupational status												
Employed	—			—			—			0.74	0.47–1.16	0.185
Unemployed	—			—			—			1.00		
Number of children												
≥ 3	—			1.21	0.63–2.30	0.564	—			—		
2	—			1.53	0.87–2.68	0.140	—			—		
1	—			1.00			—			—		
Age of first child												
≥ 7	—			1.82	1.18–2.80	0.007	—			—		
≤ 6	—			1.00			—			—		
Time living in current area of residence												
≥ 6	—			1.43	0.90–2.26	0.131	—			—		
3–5	—			1.30	0.81–2.08	0.277	—			—		
≤ 2	—			1.00			—			—		
Satisfaction with income												
Satisfied	1.45	0.89–2.37	0.138	—			2.40	1.04–5.52	0.040	2.44	1.38–4.29	0.002
Unsatisfied	1.00			—			1.00			1.00		
Social cohesion												
High	2.34	1.48–3.68	<0.001	1.22	0.86–1.72	0.265	—			—		
Low	1.00			1.00			—			—		
Interactions with other parents												
Yes	1.72	1.07–2.76	0.025	1.56	1.09–2.25	0.016	2.16	1.04–4.50	0.039	2.59	1.56–4.31	<0.001
No	1.00			1.00			1.00			1.00		

Note: n=810. AOR: adjusted odds ratio; CI: confidence interval. Discussion; There is discussion amongst the local residents regarding disaster evacuation, “Discussion” was used as the dependent variable in this model (No=0; Yes=1). Prevention map; I have a disaster prevention map of the area, “Prevention map” was the dependent variable in this model (No=0; Yes=1). Evacuation drills; I have previously participated in disaster evacuation drills conducted in the area, “Evacuation drills” was the dependent variable in this model (No=0; Yes=1). Emergency kit; I have a bag prepared to take in the event of a disaster, “Emergency kit” was the dependent variable in this model (No=0; Yes=1).

education (AOR=1.96, 95% CI=1.32–2.92), and interactions with other parents (AOR=1.56, 95% CI=1.09–2.25).

“I have previously participated in disaster evacuation drills conducted in the area” was significantly associated with satisfaction with income (AOR=2.40, 95% CI=1.04–5.52) and interactions with other parents (AOR=2.16, 95% CI=1.04–4.50).

“I have a bag prepared to take in the event of a disaster” was significantly associated with satisfaction with income (AOR=2.44, 95% CI=1.38–4.29) and interactions with other parents (AOR=2.59, 95% CI=1.56–4.31).

DISCUSSION

Examination of the relationship between social capital and disaster preparedness by the parents of infants in the community showed that those who interacted with friends through child rearing engaged in aspects of disaster preparedness such as discussing how to respond during a disaster, possessing a disaster-prevention map, participating in evacuation drills, and preparing a disaster kit. The parents' estimates of social cohesion were also related to discussing how to respond during a disaster with neighbors.

Participant characteristics

Of the participants in this study, 8.6% were men and 91.4% were women, and one group with a higher proportion of women than was indicated in the 2015 census³⁵ was observed in Okinawa Prefecture (men, 49.2%; women, 50.8%). This was attributed to the fact that the survey was conducted at meeting halls where infant health checkups were performed, which biased the gender of the parents who accompanied the children. Single-parent households accounted for 7.3% of households with children in the Comprehensive Survey of Living Conditions³⁶ and 6.9% in the present survey. A survey of households with preschool-aged children in Okinawa Prefecture³⁷ found that single-parent households accounted for 5.0% of households with a 1-year-old child and 12.4% of households with a 5-year-old child. Therefore, the participants of the present study were concluded to be an intermediate group for Okinawa Prefecture. Examination of the number of children per household showed that

17.5% had one child, 44.6% had two children, and 37.9% had three or more children. The proportion with three or more children was greater than seen in the Comprehensive Survey of Living Conditions³⁶ (one child, 46.4%; two children, 40.4%; three or more children, 13.1%). Thus, participants in the present survey had more children than the country as a whole.

The proportion of participants who were unemployed was 26.7%, and the proportion of unemployed participants from a household with a 3-year-old child was 39.2%. In a survey of parents in Okinawa Prefecture with preschool-aged children³⁷, the proportion of unemployed participants was 23.9% for households with a 1-year-old child and 20.9% for households with a 5-year-old child. Thus, the participants of the present study approximated the situation for Okinawa Prefecture as a whole.

With regard to educational level, 35.3% had a high school education or less, which was comparable to the proportion seen in the survey of households with preschool-aged children in the prefecture (28.2% of mothers and 35.3% of fathers in households with a 1-year-old child, 35.3% of mothers and 38.0% of fathers in households with a 5-year-old child).

The proportion of participants who were dissatisfied with their income was 31.9%. Although a strict comparison is difficult because the questions differed, in a survey conducted in Okinawa Prefecture that asked participants to respond on a five-step scale to the question “How do you feel about your current home life?”, 36.2% of those in households with a 1-year-old child and 37.3% of those in households with a 5-year-old child answered “very difficult” or “somewhat difficult.” For the country as a whole (Comprehensive Survey of Living Conditions), the combined proportion that answered “very difficult” or “somewhat difficult” was 63.5% among respondents from households with children. Although there was a bias toward participation by mothers in the present survey, the above results indicated that the participants constituted a group that was representative of parents raising infants in Okinawa Prefecture and accurately reflected their circumstances with respect to employment, educational level, and satisfaction with income.

In the present study, participation in disaster evacuation drills showed the lowest level of disaster preparedness with only 5.3% of parents raising infants. A survey we conducted on local welfare

commissioners and university students in Okinawa Prefecture found that 30% of the local welfare commissioners and 1% of the students had participated in evacuation drills³⁸). In Wakayama Prefecture, where earthquakes originating from the Nankai Trough are a concern³⁹), 50% of residents have participated in disaster-prevention exercises. In addition, a study that surveyed the parents of disabled children and children with typical development found that although participation in disaster-prevention exercises exceeded 50% for both groups, the participation rate was higher for the parents of disabled children⁴⁰). By comparison, the evacuation drill participation rate of parents of infants in Okinawa Prefecture was concluded to be low. Disaster preparedness at the family level is essential to reducing the negative impacts of a disaster⁴¹), and previous experiences have shown that effective evacuation during a disaster saves many lives^{8, 42}). Moreover, it has been reported that the evacuation rate during the Great East Japan Earthquake was significantly greater in residents of the affected areas who had participated in tsunami evacuation drills⁴³). Thus, participation in evacuation drills conducted by the local community as disaster preparedness should be recommended. However, because it is difficult for individual residents to hold disaster evacuation drills, it is necessary for local municipalities to make an effort to hold evacuation drills in order to protect residents from disasters.

The present study showed that satisfaction with income was associated with the preparation of an emergency kit for disasters and participation in evacuation drills. As with evacuation drills, preparation of an emergency kit was a low rate compared to previous studies for local welfare commissioners conducted in the same area³⁸). There is a global emphasis on the widespread distribution of disaster kits^{12, 44, 45}). For example, the United States FEMA campaign recommends households prepare a disaster kit, and was prepared disaster kits 50% of residents¹²). In Nepal, the preparation of an emergency kit is also recommended and a disaster prevention program at home has been instituted⁴⁴). On the other hand, previous studies have also demonstrated that socioeconomic factors influence disaster preparedness⁴⁶⁻⁴⁸), reporting that a financial investment is necessary for advance preparation such as home renovation. Okinawa Prefecture, where the present survey was conducted, has the

lowest household income among municipalities in Japan⁴⁹), and this indicates a high probability that disaster preparedness requiring a financial investment may be neglected if it is left to individual efforts alone. Since preparation of an emergency kit is related to financial circumstances, the necessity of providing support including financial support has been suggested in order to increase the disaster prevention capabilities of parents raising infants.

Disaster preparedness and social capital

The present study found an association between the status of disaster preparedness regarding evacuation in parents raising infants and social capital.

Social cohesion that represents the relationships with support, trust, getting along with each other and residents sharing the same values was associated with the disaster preparedness item "There is discussion amongst the local residents regarding disaster evacuation." A previous study in Centers for Disease Control and Prevention workers showed that those who hold a cooperative awareness with their neighbors in their daily lives are prepared at home for disasters⁵⁰) and a study conducted in disaster survivors found that a bond with local people helps maintain disaster preparation³²). The target population of the present study was parents raising infants in Okinawa, and those with high-level relationships with neighbors had more discussions with neighboring residents about disaster evacuation than those with low-level relationships. When real disaster occurs, cooperation between neighboring residents is essential especially before public aid arrives³), and discussion amongst neighboring residents during normal times concerning what to do in the event of a disaster is crucial. After Hurricane Katrina in the United States, over 5000 children were separated from their families⁶). In families raising infants, parents need to carry small children or hold their hands during an evacuation. We therefore postulate that effective evacuation can be attained by devising a disaster evacuation method through discussions with neighboring residents, attaining their understanding and establishing a cooperative system.

In the concept of communities in recent years, a united awareness as a community based on emotional and cultural ties as well as a community that links independent individuals as friends in the same situation are important perspectives⁵¹). We interpreted interaction with those who became

friends through child rearing as a type of social capital for parents raising infants and investigated the association between this social capital and disaster preparedness. Parents who have interactions with other parents they met through child rearing showed a positive correlation with “There is discussion amongst the local residents regarding disaster evacuation,” “I have a disaster prevention map of the area,” “I have a bag prepared to take in the event of a disaster,” and “I have previously participated in disaster evacuation drills conducted in the area.” High social capital is known to be useful in the rapid spreading of health information and in the promotion of health-related activities based on social management functioning against deviant behavior²⁷. Social capital can be categorized into bonding type and bridging type²⁶. We interpreted social cohesion with neighbors as bonding social capital and interaction with friends acquainted through child rearing as bridging social capital. Bridging social capital is known to have a strong ripple effect of information. For this reason, the usefulness of disaster prevention education using the standards and networks of those who are in the same situation (child rearing) was suggested when considering the strengthening of disaster preparedness in parents raising infants. Good relationships with neighbors and friends have also been found to have a positive impact on disaster preparedness in families with disabled children, and this relationship is particularly strong for households with physically disabled children who require mobility assistance⁵². Similar results have been seen for caregivers of elderly individuals²¹, suggesting that social capital in the form of relationships with friends and neighbors may fulfill a common function in disaster preparedness for individuals whose evacuation during disasters requires special consideration. Social capital is thought to be created through connections with family members during childhood and participation in community activities. Taken together with the results of the present study, which showed that interactions with friends through child rearing has a positive effect on disaster preparedness, this indicates that it will be important from a public health perspective for governments to establish organizations and funding to hold events related to disaster prevention at places where friends who associate through child rearing gather, such as

parenting circles and nursery schools.

LIMITATIONS

The present study elucidated that social capital is associated with the disaster preparedness of parents raising infants who cannot evacuate on their own during a disaster. In particular, the present study was the first to clarify that the social capital of other parents is associated with disaster preparedness for parents raising infants, and this finding was considered to be valuable. However, there are several limitations to the present study. The first limitation is the representativeness of the study population. The participants were not strictly selected with a randomized sampling process because the survey was conducted in local municipalities that had agreed to cooperate in the survey, and were restricted to parents who visited the participating health agencies for 3-year-old health checkups.

Although childbirth by women who are 20 years old or younger accounts for 2.5% of all births in Okinawa Prefecture⁵³, which is higher than in the country as a whole (1.3%), the present survey did not include participants in this age group. It also did not take into account whether the children of the parents had an illness or disability. Consequently, the results may not reflect the views of households with young parents or children with special health care needs. Moreover, because most of the respondents were women, the results reflect the views of mothers in the households. Thus, there are limitations in generalizing the results obtained in the present study. For this reason, a follow-up with an expanded study population, a survey conducted in a different area, or a study population based on resident registration is necessary. Moreover, disaster preparedness also includes items that were not analyzed in the present study, and it is therefore necessary in the future to conduct an investigation including these items. Furthermore, due to the cross-sectional nature of the present study, the causal relationship could not be clarified.

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