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Cognitive function measured with the Revised Hasegawa's Dementia Scale among elderly individuals in Lao PDR

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ABSTRACT

In Lao PDR, measurement of cognitive function has rarely been conducted among elderly individuals. This study aimed to investigate the cognitive function among elderly individuals who lived at their homes with family in Lao PDR. Participants were elderly individuals aged 60 years or over registered with the local government in urban (Vientiane capital; VC) and rural areas (Khammouane province; KP). Those with serious mental/physical diseases, those who could not walk by themselves, or those who could not speak the Lao language were excluded. The information was collected through interviews with the participants and their family members. A newly developed Lao version of the Revised Hasegawa's Dementia Scale (HDS-R) was applied to measure cognitive function. The participants were 414 elderly individuals (224 males and 190 females) aged 60 to 98 years. The average HDS-R score was 23.0 among 115 men in VC, 22.7 among 92 women in VC, 20.3 among 109 men in KP, and 17.5 among 98 women in KP. The main caregiver was a daughter (40.6%) followed by a spouse (31.4%). Among 414 elderly individuals, 42 (10.0%) stated the necessity of support. Those with HDS-R < 20 accounted for 38.8% in men and 48.9% in women. The adjusted odds ratio of HDS-R < 20 was significant for those in rural areas (3.83) relative to those in urban areas. Among superficially healthy elderly individuals residing with their families, those with reduced cognitive function were more common among women and in rural areas.

Keywords: cognitive function, healthy elderly, Lao PDR, Revised Hasegawa's Dementia Scale, urban/rural regions

INTRODUCTION

Along with the aging of society, the number of elderly with reduced cognitive function has been increasing worldwide.[1] It was estimated that dementia would affect more than 131.5 million people by 2050.[2] In a study using an adapted version of the Child Health and Nutrition Research Initiative method, this global problem was recognized as a high priority.[3] In Asia, the estimated

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figure of those with dementia was 22.85 million among 485.83 million of the population aged 60 years or older in 2015.[2]

Lao PDR is a landlocked country with a population of 6.4 million, 32.0% of whom are aged less than 15 years, and 4.2% of whom are elderly individuals aged 65 years and older, according to the National Statistics Bureau, Population Census in 2015. As of 2010, there were 4 central general hospitals, 3 special hospitals, 4 regional hospitals, 12 provincial hospitals, 130 district hospitals, and 860 health centers throughout Lao PDR.[4] Since no reporting system on cause of death is established in Lao PDR, nationwide mortality statistics are not available. The disease frequencies have been reported on a research basis; hospital-based mortality in a tertiary hospital,[5] cancer mortality,[6] stroke mortality,[7] acute disease epidemic,[8] HIV cases,[9] and so on.

There were no studies on cognitive function among elderly individuals in Lao PDR. At first, the authors developed the Lao version of the Revised Hasegawa's Dementia Scale (HDS-R) through back translation and a pilot study.[10] The HDS was developed by Kazuo Hasegawa in 1974 and revised (HDS-R) in 1991. The original HDS-R was developed in Japanese, and it was then translated into English.[11] Additionally, it was translated into Korean[12,13] and Chinese.[14,15] This study aimed to report the distribution of cognitive function of elderly individuals who lived with their families using a Lao version of the HDS-R.

MATERIALS AND METHODS

Participants

Participants were elderly individuals aged 60 years or older registered at the local government. Eight villages in urban areas (Sikhottabong district and Sisattanack district in Vientiane Capital; VC) and 8 villages in rural areas (Nongbok district and Xebanghai district in Khammouane Province; KP) were arbitrary selected. In each village, all households with elderly people were listed for this study. Among them, 25 households were randomly selected. All selected participants and heads of households were informed before the study team arrived at the selected villages. Those elderly individuals with serious mental/physical diseases, those who could not walk by themselves, or those who could not speak the Lao language were excluded at the point of interview. Volunteers meeting the above eligibility who wanted to join the health checkup (height, weight, blood pressure, etc.) were accepted and included in the participants, resulting in 414 participants in total.

Methods of data collection

The face-to-face interview was conducted at the homes of selected participants by trained interviewers. The questionnaire included demographic factors, lifestyle, and Lao language HDS-R. Although the educational level of the participants seems to be useful to evaluate the HDS-R score, it was not available. Since those aged 60 years or older in 2017 spent their adolescence in the middle of a civil war, formal education was not provided for the majority of the participants. Height, weight, and blood pressure were measured at the interview. Blood pressure was measured three times using a digital manometer. All data were collected electronically via a customized CommCare-HQ (Dimagi, Boston, USA) application deployed on portable Samsung tablets.

Revised Hasegawa's Dementia Scale (HDS-R)

The HDS-R consists of nine questions; question 1 on age (1 point), question 2 on the date (4 points), question 3 on place (2 points), question 4 on ability to repeat 3 familiar words (3 points), question 5 on 2 times of subtraction of 7 from 100 (2 points), question 6 on backwards

repetition of 3 and 4 digits (2 points), question 7 on recall of the three words memorized in question 4 (6 points), question 8 on immediate recall of 5 object pictures shown and hidden (5 points), and question 9 on the listing of 10 vegetable names (5 points).[10,11] The full score on the HDS-R is 30 points. A score of 20 points or lower is considered to be an indicator of the presence of reduced function. To measure cognitive function accurately, both cooperation by the examinee and skill of examiner are necessary. Accordingly, an HDS-R manual was developed to standardize the skills of examiners.[10]

Statistical analysis

Since this was the first study using the HDS-R with an explorative purpose, the sample size was not calculated based on a given assumption. However, we aimed to collect 400 participants. In this sample size, the maximum standard deviation (SD) of the proportion is 2.5% in case the proportion of a factor/outcome is 50% of the participants, giving a 95% confidence interval (CI) of 45.0 to 55.0% for 50%.

The 95% CI for the frequency was calculated based on binomial distribution. Logistic regression analysis was applied to estimate the odds ratio (OR) and its 95% CI. The calculation was done by STATA version 12.

Ethical issues

The purpose of this questionnaire study was explained before the interview. Consent was obtained from interviewees and/or family members. The dataset was made anonymously. This study was approved by the National Ethics Committee for Health Research, Ministry of Health, Lao PDR (No 003/NECHR), and by Nagoya University School of Medicine (No 9176).

RESULTS

The participants were 414 elderly individuals (224 males and 190 females) aged 60 to 98 years, as shown in Table 1. The same number of elderly individuals participated in this study from urban and rural areas. There were fewer drinkers and smokers among women than among men. One third of participants were under medication. The average (SD) of height was 157.1 (11.2) cm in men and 148.4 (12.7) cm in women. The average (SD) of weight was 58.6 (11.2) kg and 52.1 (11.1) kg, respectively. Those with systolic blood pressure more than 140 mmHg or diastolic blood pressure more than 90 mmHg accounted for about a half, and those with systolic blood pressure more than 160 mmHg or diastolic blood pressure more than 95 mmHg accounted for 20.5% of men and 18.4% of women.

Table 2 shows caregivers and care for participants according to sex. The participants who lived with 4 or more family members accounted for 81.7% of male participants and 81.1% of female participants. Among 414 elderly individuals, 42 (10.1%; 95% CI, 7.4–13.5%) stated the necessity of support for 1 or more care services. However, among 52 necessary care services, 23 were “buying clothes.” The main caregiver was a daughter (6.3%; 95% CI, 4.1–9.1%), followed by a spouse (2.2%; 95% CI, 1.0–4.1%).

Table 3 shows HDS-R scores according to sex. Those with HDS-R < 20 accounted for 38.8% (95% CI, 32.4–45.6) of men and 48.9% (95% CI, 41.6–56.3%) of women. More than 90% of participants answered correctly their age and location and repeating three words. The proportions of those who subtracted 7 correctly and those who correctly repeated 3 and 4 digits backward were 33.8% (95% CI, 29.3–38.6%) and 32.1% (95% CI, 27.6–36.9%), respectively. The proportions of those who stated 10 vegetable names were the smallest; 13.8% (95% CI, 9.6–19.1%)

for men and 15.3% (95% CI, 10.5–21.2%) for women. A statistical difference between male and female participants was observed in the questions of date (question 2) ($p<0.001$), repeating three words ($p<0.05$), subtraction ($p<0.001$), and backward repetition of 3 and 4 digits ($p<0.001$).

Table 4 demonstrates the mean and SD of the total score according to the characteristics of the participants. The average (SD) of the total HDS-R score was 21.7 (5.5) points in men and 20.0 (6.2) points in women. The difference was significant ($p<0.01$). Those aged 80 years or over had a significantly lower score than those aged 60 to 69 years ($p<0.001$). The average

Table 1 Characteristics of subjects according to sex

Characteristics		Males		Females		Total	
		N	%	N	%	N	%
Age (years)	60–64	79	35.3	59	31.1	138	33.3
	65–69	65	29.0	50	26.3	115	27.8
	70–74	37	16.5	36	18.9	73	17.6
	75–79	18	8.0	19	10.0	37	8.9
	80–84	13	5.8	13	6.8	26	6.3
	85–98	12	5.4	13	6.8	25	6.0
Residency	Urban†	115	51.3	92	48.4	207	50.0
	Rural‡	109	51.3	98	51.6	207	50.0
Drinking	No	151	67.4	175	92.1	326	78.7
	Yes	73	33.6	15	7.9	88	21.3
Smoking	No	161	71.9	183	96.3	344	83.1
	Yes	63	28.1	7	3.7	70	16.9
Medication	No	149	66.5	126	66.3	275	66.4
	Yes	75	33.5	64	33.7	139	33.6
Height (cm)	–139	0	0.0	8	4.2	8	1.9
	140–149	32	14.3	94	49.5	126	30.4
	150–159	100	44.6	74	38.9	174	42.0
	160–169	84	37.5	14	7.4	98	23.7
	170–	8	3.6	0	0.0	8	1.9
Weight (kg)	–39	3	1.3	25	13.2	28	6.8
	40–49	48	21.4	62	32.6	110	26.6
	50–59	84	37.5	53	27.9	137	33.1
	60–69	57	25.4	39	20.5	96	23.2
	70–79	20	8.9	9	4.7	29	7.0
	80–	12	5.4	2	1.1	14	3.4
Blood pressure	Normal	108	48.2	103	54.2	211	51.0
	High§	116	51.8	87	45.8	203	49.0
	(High¶)	(46)	(20.5)	(35)	(18.4)	(81)	(19.6)
Total		224	100	190	100	414	100

† Vientiane Captal (Sikhottabong district and Sisattanack district)
‡ Khammouane Province (Nongbok district and Xebanghai district)
§ Systolic blood pressure > 140 mmHg or diastolic blood pressure > 90 mmHg for the average of three measurements
¶ Systolic blood pressure > 160 mmHg or diastolic blood pressure > 95 mmHg for the average of three measurements

among those residing in the rural areas was significantly lower than among those in the urban areas. Those who needed supporters had a significantly lower HDS-R score than those who did not ($p<0.05$), when men and women were combined.

The OR and 95% CI of the scores <20 are shown in Table 5. There were no large differences in the OR between the unadjusted and the adjusted. Those aged 80 years or over were about 4 times more likely to have a low score than those aged 60 to 69 years. A similar high risk was observed among those in the rural areas.

Table 2 Care of subjects according to sex

Characteristics		Males		Females		Total	
		N	%	N	%	N	%
Family	1	1	0.4	6	3.2	7	1.7
member	2–3	40	17.9	30	15.8	70	16.9
excluding	4–5	63	28.1	61	32.1	124	30.0
subject	6–7	56	25.0	51	26.8	107	25.8
	8–	64	28.6	42	22.1	106	25.6
Support	Not needed	206	92.0	166	87.4	372	90.0
	Needed	18	8.0	24	12.6	42	10.1
Care†	Meal	0	0.0	2	1.1	2	0.5
	Toilet	0	0.0	3	1.6	3	0.7
	Bathing	0	0.0	4	2.1	4	1.0
	Changing clothes	0	0.0	5	2.6	5	1.2
	Buying clothes	9	4.0	14	7.4	23	5.6
	Others	9	4.0	6	3.2	15	3.6
	None	206	92.0	166	87.4	372	89.9
Main	Spouse	8	3.6	1	0.5	9	2.2
care	Daughter	7	3.1	19	10.0	26	6.3
giver‡	Son	1	0.4	1	0.5	2	0.5
	The other§	2	0.9	3	1.6	5	1.2
Total		224	100	190	100	414	100

† Among 42 subjects, 52 cares were listed. The percentage is against 414.
‡ Those for 42 subjects who stated to need support
§ Daughter in law for one male and one female, son in law for one female, mother aged 84 years for one male aged 60 years, and the other relative for one female.

Table 3 Revised Hasegawa's Dementia Scale (HDS-R) according to sex

Characteristics		Males		Females			Total	
		N	%	N	%		N	%
Total score	0–10	10	4.5	14	7.4		24	5.8
	11–15	20	8.9	26	13.7		46	11.1
	16–20	57	25.4	53	27.9		110	26.6
	21–25	76	33.9	53	27.9		129	31.2
	26–30	61	27.2	44	23.2		105	25.4
Question 1	0	7	3.1	11	5.8		18	4.3
(Age)	1	217	96.9	179	94.2		396	95.7
Question 2	0	8	3.6	17	8.9		25	6.0
(Date)	1–3	85	37.9	101	53.2	***	186	44.9
	4	131	58.5	72	37.9		202	48.8
Question 3	0	2	0.9	7	3.7		9	2.2
(Place)	1	10	4.5	10	5.3		20	4.8
	2	212	94.6	173	91.1		385	93.0
Question 4	0	8	3.6	4	2.1		12	2.9
(Repeat)	1–2	7	3.1	16	8.4	*	23	5.6
	3	209	93.3	170	89.5		379	91.5
Question 5	0	53	23.7	101	53.2		154	37.2
(Subtraction)	1	75	33.5	45	23.7	***	120	29.0
	2	96	42.9	44	23.2		140	33.8
Question 6	0	53	23.7	79	41.6		132	31.9
(Backward repeat)	1	77	34.4	72	37.9	***	149	36.0
	2	94	42.0	39	20.5		133	32.1
Question 7	0	30	13.4	26	13.7		56	13.5
(Recall)	1–3	36	16.1	27	14.2		63	15.2
	4–5	56	25.0	41	21.6		97	23.4
	6	102	45.5	96	50.5		198	47.8
Question 8	0	5	2.2	6	3.2		11	2.7
(Objects name)	1–2	15	6.7	17	8.9		32	7.7
	3–4	63	28.1	50	26.3		113	27.3
	5	141	62.9	117	61.6		258	62.3
Question 9	0	78	34.8	59	31.1		137	33.1
(Vegetable name)	1–2	64	28.6	61	32.1		125	30.2
	3–4	51	22.8	41	21.6		92	22.2
	5	31	13.8	29	15.3		60	14.5
Total		224	100	190	100		414	100

* $p<0.05$, ** $p<0.01$, *** $p<0.001$ by a chi-square test

Table 4 Mean and standard deviation (SD) of Revised Hasegawa's Dementia Scale (HDS-R) according to sex

Characteristics		Males		Females		Total	
		Mean	SD	Mean	SD	Mean	SD
Age	60–69	22.4 –	5.2	21.3 –	5.4	21.9 –	5.3
	70–79&	21.9	5.1	19.8	5.8	20.9	5.5
	80–	16.7 ***	6.3	15.4 ***	7.7	16.0 ***	7.0
Region	Urban	23.0 –	4.7	22.7 –	5.0	22.7 –	5.0
	Rural&&	20.3 ***	6.0	17.5 ***	6.1	18.8 ***	5.4
Family	1	17.0	nc	19.8	4.3	19.4	4.1
excluding	2–3&&	22.0 –	5.4	17.3 –	6.4	19.9 –	6.3
subject	4–5&	22.3	5.4	19.7	6.2	21.0	5.9
	6–7	22.3	4.5	21.1 **	5.7	21.7 *	5.3
	8–	20.4	6.1	21.2 *	6.2	20.7	6.1
Supporter	Not needed&&	21.8 –	5.2	20.3 –	5.9	21.1 –	5.6
	Needed	19.7	8.2	18.4	7.6	18.9 *	7.8

* p<0.05, ** p<0.01, *** p<0.001 by a *t*-test for the different level of characteristics relative to the level with "–"
& p<0.05 and && p<0.01 by a *t*-test for the different between males and females
nc: not calculable due to n=1

Table 5 Odds ratio (OR) and 95% confidence interval (CI) of a low score (<20) of Revised Hasegawa's Dementia Scale (HDS-R)

Characteristics		Unadjusted		Adjusted†	
		OR	95% CI	OR	95% CI
Sex	Males	1	Reference	1	Reference
	Females	1.51	1.02–2.23	1.45	0.95–2.21
Age (years)	60–69	1	Reference	1	Reference
	70–79	1.20	0.76–1.89	1.31	0.80–2.14
	80–	3.86	2.01–7.42	3.94	1.93–8.02
Region	Urban	1	Reference	1	Reference
	Rural	3.69	2.45–5.56	3.83	2.44–6.01
Family	1–3	1	Reference	1	Reference
	4–5	0.61	0.34–1.08	0.79	0.43–1.48
	6–	0.50	0.30–0.86	0.73	0.41–1.31
Supporter	Not needs	1	Reference	1	Reference
	Needs	1.49	0.79–2.82	1.54	0.73–3.27

† Adjusted for the variables listed above

DISCUSSION

This was the first study on the cognitive function among elderly individuals in a community in Lao PDR. The great majority of participants did not need care. However, the percentage of those with HDS-R scores <20 was relatively high. The scores were low in the questions on date (question 2), subtraction (question 5), backward repetition of 3 and 4 digits (question 6), recall of words (question 7), and naming of vegetables (question 9). As expected, the average score was lower among the older participants, in the rural areas, and among those needing support.

The HDS-R has been applied for patients such as those with Alzheimer's disease,[16] amyotrophic lateral sclerosis,[17] and diabetes mellitus,[18] while the application to elderly individuals living in a community was rare. In a Japanese study, the score among 592 independent community-dwelling elderly residents aged 65 years or older was examined between one rural area and two urban areas with a similar age distribution. The proportions of those with HDS-R <20 were 8.4% in the rural area and 2.0% in the urban areas. The percentage tended to be higher in male than in female participants (marginally significant, p=0.06). Older age was significantly associated with lower score in these participants.[19]

In this dataset of Lao PDR, those with HDS-R <20 were more frequent: 38.8% in men and 48.9% in women, notwithstanding the participants including those aged 60 to 64 years. It was partly due to the low score of calculations (questions 6 and 7), not due to the reduction of cognitive function. It was reported that education influenced HDS-R scores.[13] The limited chance of education among those generations in Lao PDR might disturb the improvement of calculation ability. Additionally, the number of vegetables used in daily life might be actually limited, and participants might not be accustomed to this kind of quiz, partly because of the limited occasion of education in their adolescence. In the other hand, the associations of the HDS-R score with sex and age were not as marked in the dataset. Although the reason was not clear, the survival of elderly individuals with a reduced cognitive function might be relatively difficult in Lao PDR, where the average life expectancy was 62 years in men and 65 years in women according to the 2015 census.

This study was a challenge to apply HDS-R with minor modifications to the elderly in Lao PDR. In order to maintain the compatibility with the other countries, the major modification taking the educational level and number of vegetables into account may not be appropriate. The major modifications such as removal of the question 5 (subtraction) and reduction of vegetable name number (question 9) remain to be carefully examined. In addition, HDS-R <20 may not be appropriate for the clinical use to diagnose the reduced cognitive function in Lao PDR. The normal range should also be examined for those in Lao PDR.

As a scale to measure cognitive function, the Mini-Mental State Examination (MMSE) with 11 questions has been used worldwide,[20] even in Asian countries.[21] One disadvantage of the MMSE is in the questions to measure the reading and writing ability of participants. In many countries, especially in Asia, there are people who cannot read the common language of the country, for example, illiterate people and minorities using a different language. The HDS-R does not include such questions. This is a large advantage of the HDS-R over the MMSE.

Limitations of this study are as follows. Firstly, the number of participants was not large, resulting in limited subgroup analysis. The second limitation was the representativeness of the participants. Although the participants were selected randomly from the registered list of each district, the villages for study were selected for convenience. Elderly individuals who were not at home when the study team visited were not included. The number of elderly individuals who rejected study participation was negligible, but the precise number was not recorded. Thirdly, since the data were obtained through interviews with elderly individuals and/or their families,

they might include several misclassifications.

In conclusion, this first study on cognitive function measured HDS-R scores among elderly individuals aged 60 years or older, and demonstrated a higher percentage of those with reduced cognitive function. Since several factors influence the HDS-R score, detailed comparisons with those in different areas and different circumstances are needed.

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COMPETING INTERESTS

The authors have declared that no competing interests exist.

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