

## Correlation of Cognitive Impairment with Constipation and Renal Failure (Kolerasi Kecelakaan Kognitif dengan Sembelit dan Kegagalan Ginjal)

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### ABSTRACT

*The improvement of health care support has greatly extended the average life expectancy over the last 50 years, which has increased the rate of cognitive decline consequently. The avoidance of risk factors such as toxins, stress and somatic diseases can be protective against the reduction of cognitive function in the elderly. This study aimed to determine the effects of socio-demographic factors, constipation and renal failure on cognitive status among 2322 samples who were the non-institutionalized Malaysian elderly. The multiple logistic regression analysis was applied to estimate the risk of such factors on cognitive decline in subjects. Approximately, 77.54% of samples experienced cognitive impairment. The results showed that advanced age (odds ratio (OR) = 1.03), Malay ethnic (OR = 2.15), constipation (OR = 3.31) and renal failure (OR = 4.42), significantly increased the risk of cognitive impairment in subjects ( $p < 0.05$ ). In addition, education (OR = 0.38) significantly reduced the risk. However, we concluded that age, Malay ethnic, constipation and renal failure increased the risk of cognitive impairment in subjects but education reduced the risk.*

*Keywords: Cognition; constipation; dementia; renal failure*

### ABSTRAK

*Peningkatan sokongan penjagaan kesihatan telah melanjutkan purata tempoh jangka hayat sejak 50 tahun yang lepas, yang secara tidak langsung telah meningkatkan kadar kemerosotan kognitif. Mengelakkan faktor risiko seperti toksin, tekanan dan penyakit berkenaan tubuh badan boleh menjadi pelindung terhadap pengurangan fungsi kognitif dalam kalangan warga tua. Kajian ini bertujuan untuk menentukan kesan faktor sosio-demografi, sembelit dan kegagalan buah pinggang ke atas status kognitif dalam 2322 sampel warga tua yang tidak menghuni rumah warga tua. Analisis regresi logistik berganda digunakan untuk menganggar faktor risiko pada kemerosotan kognitif dalam subjek. Lebih kurang 77.54% daripada sampel mengalami kemerosotan nilai kognitif. Keputusan menunjukkan bahawa umur lanjut (nisbah kemungkinan [OR] = 1.03), bangsa Melayu (OR = 2.15), sembelit (OR = 3.31) dan kegagalan buah pinggang (OR = 4.42), secara bererti meningkatkan risiko kemerosotan kognitif dalam subjek ( $p < 0.05$ ). Sebagai tambahan, pendidikan (OR = 0.38) dengan ketara mengurangkan risiko. Walau bagaimanapun, kami membuat kesimpulan bahawa usia, bangsa Melayu, sembelit dan kegagalan buah pinggang meningkatkan risiko kemerosotan nilai kognitif dalam subjek tetapi pendidikan mengurangkan risiko.*

*Kata kunci: Demensia; kegagalan buah pinggang ; kognisi; sembelit*

### INTRODUCTION

The improvement of health care support has greatly extended the average life expectancy over the last 50 years. The increased life expectancy results in a substantial increase in the number of people aged 65 years and above (DeCarli 2003) and also in the rate of cognitive impairment (Kensinger & Corkin 2009).

Cognitive impairment may occur due to aging (Eshkoor et al. 2015; Sherina et al. 2004; Woodford & George 2007), physical problems and mental disorders (Sherina et al. 2004). It presents with the impairment of memory, attention, language and judgement (Eshkoor et al. 2015; Woodford & George 2007). The decline of cognition in the elderly (Rashid et al. 2012; Reitz & Mayeux 2010; Sherina et al. 2004) can damage their social, functional and occupational activities (Woodford & George 2007).

The prevalence of cognitive impairment is approximately 21.5 to 71.3 per 1000 person-years among seniors (Tricco et al. 2012) and about 11% in the Malaysian elderly (Rashid et al. 2012). Older people often suffer from chronic diseases (Canbaz et al. 2003) such as constipation and kidney failure. The prevalence of chronic kidney disease (CKD) (Bugnicourt et al. 2013; Smyth 2012) and end stage renal disease (ESRD) increases in the elderly (Smyth 2012). All stages of CKD can cause cognitive problems and lessen the quality of life in the elderly (Bugnicourt et al. 2013).

Constipation is an unsatisfactory defecation disorder characterized by infrequent stools, difficult stool passage, or both. It is one of the most frequent gastrointestinal problems in the elderly (Gallegos-Orozco et al. 2012). Constipation can affect the quality of life in the elderly (Basilisco &

Coletta 2013; Gallegos-Orozco et al. 2012) when causes the psychological co-morbidities including somatisation, anxiety and depression (Basilisco & Coletta 2013) as well as economic burden (Gallegos-Orozco et al. 2012).

Constipation, renal failure and cognitive impairment are common problems in the elderly. There is no study, which compares the role of constipation and renal failure in causing cognitive impairment in the elderly and the Malaysian elderly; therefore, this study aimed to determine this preference on cognitive function in the Malaysian elderly.

#### MATERIALS AND METHODS

The project (Project Code: NN-060-2013) was a heterogeneous survey entitled 'TUA-Neuroprotective Model for Healthy Longevity among the Malaysian Elderly' and carried out in co-operation with the Universiti Kebangsaan Malaysia (UKM) and the Malaysian Research Institute on Aging (MyAgeing), Universiti Putra Malaysia (UPM). The approval and permission for conducting the study were received from the Ethical Committee of the Universiti Kebangsaan Malaysia.

The research recruited 2322 subjects who were Malaysian elderly aged 60 years and above that were residing in non-institutional places. Subjects were collected from different ethnicities, including Malays, Chinese, Indians and others. The elderly living in institutions and bedridden were excluded. Participants were gathered at community halls and centers for interview session and health screening. The trained fieldworkers conducted a face-to-face interview.

The effects of constipation, renal failure and socio-demographic factors on cognition were evaluated. The Mini-Mental State Examination (MMSE) test was used to mark cognitive levels in samples (Folstein et al. 1975) and the score of 26 or less was marked as cognitive impairment. The questionnaires were used to collect data on socio-demography parameters including age, gender, ethnicity, marital status and education level. Constipation and renal failure were recorded based on both respondents report and physician's diagnosis.

#### STATISTICAL ANALYSIS

The prevalence of cognitive impairment was computed with regard to the selected independent variables. The bivariate analysis was carried out using a series of chi-square tests to

examine the association between cognitive impairment and each of the variables. The multivariate logistic regression analysis was applied to predict the effects of variables on cognitive impairment. Odds ratios (OR) with 95% confidence intervals (95% CI) were computed. The critical level for rejection of the null hypothesis was considered to be a *p* value of 5%, two-tailed. All analyses were done using the Statistical Package for the IBM Social Sciences (SPSS) software version 20.0 (Chicago, IL, USA).

#### RESULTS

Various analyses were run on data collected from 2322 subjects who were the Malaysian elderly. In this study, the prevalence of cognitive impairment was 77.54% (95% CI: 75.79-79.2) (Table 1).

The prevalence of cognitive impairment was 93.75% among the subjects who had renal failure. The rate of cognitive impairment among the samples with constipation was 94.34%. A greater rate of cognitive impairment was found in females (79.01%) compared to males (75.96%). It was found that single subjects (81.52%) displayed a greater rate of cognitive impairment compared to married subjects (75.7%). The prevalence of cognitive impairment in the educated subjects (74.49%) was less than those who were the non-educated (89.26%). Among all samples, Malays (82.27%) showed a higher rate of cognitive impairment compared to non-Malays (69.72%).

The bivariate analysis established the association between cognitive impairment and each of the variables by chi-square tests. The results showed a significant association between cognitive impairment and each variable, including ethnicity ( $\chi^2 = 48.60$ ,  $p < 0.001$ ), education ( $\chi^2 = 47.90$ ,  $p < 0.001$ ), marital status ( $\chi^2 = 9.62$ ,  $p = 0.001$ ), constipation ( $\chi^2 = 8.79$ ,  $p = 0.001$ ), renal failure ( $\chi^2 = 4.89$ ,  $p = 0.015$ ) and sex differences ( $\chi^2 = 3.06$ ,  $p = 0.045$ ) (Table 2).

The multiple logistic regression analysis showed that age ( $p = 0.002$ ), education ( $p < 0.001$ ), ethnicity ( $p < 0.001$ ), constipation ( $p = 0.047$ ) and renal failure ( $p = 0.044$ ) significantly contributed to the risk of cognitive impairment in respondents. The findings showed that age (OR = 1.03, 95% CI: 1.01-1.05), renal failure (OR = 4.42, 95% CI: 1.04-18.84), constipation (OR = 3.31, 95% CI: 1.02-10.79) and Malay ethnicity (OR = 2.15, 95% CI: 1.75-2.64) increased the risk of cognitive impairment in subjects. In addition, education (OR = 0.38, 95% CI: 0.28-0.53) reduced the risk (Table 3).

TABLE 1. Prevalence of cognitive impairment among 2322 elderly

Character	<i>n</i>	<i>n</i> (%)	95% C.I.
Cognitive impairment			
Yes	1775	77.54	75.79-79.2
No	514	22.46	20.8-24.21

The percentage of subjects with cognitive impairment and variables has been summarized in Table 2.

TABLE 2. Prevalence of cognitive impairment and associations with socio-demographic factors

	Total	<i>n</i>	<i>n</i> %	95% CI	$\chi^2$	<i>p</i> value
Renal failure						
No	2257	1745	77.32	75.55-79.00	4.89	0.015
Yes	32	30	93.75	79.85-98.27		
Constipation						
No	2236	1725	77.15	75.36-78.84	8.79	0.001
Yes	53	50	94.34	84.63-98.06		
Sex differences						
Male	1098	834	75.96	73.34-78.39	3.06	0.045
Female	1191	941	79.01	76.61-81.23		
Marital status						
Non-Married	725	591	81.52	78.53-84.18	9.62	0.001
Married	1564	1184	75.7	73.51-77.76		
Ethnicity						
Malays	1427	1174	82.27	80.2-84.16	48.60	<0.001
Non-Malays	862	601	69.72	66.57-72.69		
Education						
No	484	432	89.26	86.19-91.72	47.90	<0.001
Yes	1803	1343	74.49	72.43-76.45		

Significant at the 0.05 level using the chi-square test

TABLE 3. Prevalence of cognitive impairment and associations derived by logistic regression analysis

	B	SE	<i>p</i> value	OR	95% CI for OR	
					Lower	Upper
Constipation	1.197	0.603	0.047	3.31	1.02	10.79
Renal failure	1.486	0.740	0.044	4.42	1.04	18.84
Age	0.029	0.009	0.002	1.03	1.01	1.05
Marital status	0.050	0.129	0.699	0.95	0.74	1.23
Educational level	-0.958	0.168	<0.001	0.38	0.28	0.53
Ethnicity	0.764	0.105	<0.001	2.15	1.75	2.64
Sex differences	-0.091	0.117	0.433	0.91	0.73	1.15

Significant at the 0.05 level using the logistic regression analysis  
Hosmer-Lemeshow test:  $\chi^2(8) = 7.326$ ;  $p = 0.502$

## DISCUSSION

Cognitive impairment is a major personal and public health problem among the elderly (Brewster et al. 2014) and sometimes progress to dementia (Iachini et al. 2009). Finding the risk factors of cognitive impairment are important for the prevention and treatment of the reduction of cognition. Furthermore, it helps to promote a successful cognitive aging and to minimize the problems that are associated with cognitive impairment (Brewster et al. 2014).

This study assessed the effects of constipation, renal failure and socio-demographic factors on cognitive impairment in the Malaysian elderly. It was found that constipation, age, Malay ethnic and renal failure were the significant predictors of the risk of cognitive impairment in subjects. Education reduced the risk of cognitive impairment. Furthermore, our results were consistent with the previous works (Eshkoo et al. 2014; Rashid et al.

2012; Tricco et al. 2012) indicating that cognition reduces as people age (Pinto & Subramanyam 2009).

Age-related cognitive impairment is probably due to neurodegeneration, vascular problems, chronic depression and profound state of dissatisfaction (Pinto & Subramanyam 2009). Constipation is common among the elderly (Basilisco & Coletta 2013; Leung et al. 2011) and showed a prominent effect on cognitive level in this project. Constipation can indirectly affect cognitive status. Such effect is probably due to confusion, irritability and aggression caused by constipation along with feeling pain and discomfort. Furthermore, medications such as antipsychotics used in the control of behavioral disorders (Leung et al. 2011) may cause an undiagnosed constipation, which in turn aggravate cognitive decline. Co-morbidities (Leung et al. 2011) in older people may also exacerbate the reduction of cognition. Abnormalities of intestinal cells and hormone receptors such as progesterone receptor may cause constipation (Basilisco & Coletta 2013) and

memory problems as well. However, further studies are needed to determine whether constipation is either cause or a consequence of cognitive impairment.

Our research showed a prominent effect of renal failure on cognitive impairment in the elderly. All stages of CKD can reduce cognition in the elderly, which in return affects the quality of life and vice versa (Bugnicourt et al. 2013). The prevalence of cognitive impairment in the patients with ESRD is approximately 16-38%, which is about three fold higher than age-matched general population (Tamura & Yaffe 2010). Meanwhile, the rate of cognitive impairment in hemodialysis patients is estimated around 30-60%, which is at least two fold higher than age-matched controls (Bugnicourt et al. 2013). Cognitive impairment in hemodialysis patients can occur due to cerebral atrophy, serious bacterial infections (SBIs) and active vascular calcification (Brunori 2012).

However, the reduction of cognition is probably due to the effects of both kidney disease and treatment procedure (Tamura & Yaffe 2010). Decreased glomerular filtration rate (GFR) or albuminuria in the kidney can also result in endothelial damage and cerebral small vessel disease (SVD) in the brain (Kawamura et al. 2014), which lead to cognitive impairment. This study showed that ethnicity affects cognitive function as well. Although cognition declines with age, the degree of decline significantly varies among different people (Mather & Carstensen 2005) and ethnicities. Such diversity is probably because of differences in origin, genetics, health, language, life experiences, socio-economic status, and educational quality (Brewster et al. 2014).

The results of the study reflected that education can reduce or delay the risk of cognitive impairment in the elderly (Alley et al. 2007), whereas other researchers have not reported the same finding (Early et al. 2013; Zahodne et al. 2011). The positive effect of education can be explained by the improvement of a person's life due to providing health, higher income, personal relationships, career opportunities and wealth abilities (Sweetland 1996), which may protect individuals against cognitive decline. Sex differences and marital status did not show any prominent effects on cognition in subjects, which may reflect the interference of confounding factors contributing to the investigation.

#### LIMITATIONS

There are some limitations to this study. First, self-reported data can limit the accuracy in determining correctly medical health problems and cognitive levels. Thus, more studies with developed tools and more variables are needed to assess the effect of health on the age-related cognitive impairment with higher accuracy. The study design also confines the accuracy in determining the exact effects of variables on cognitive status. The presence of physical and psychological co-morbidities in subjects can limit the appropriate assessment of risk factors for cognitive function as well. Thus, further studies are needed to identify

the exact causes and risk factors for cognitive impairment among elderly.

#### CONCLUSION

We concluded that age, Malay ethnicity, renal failure and constipation were significant factors that enhance the risk of cognitive impairment in respondents. In addition, education reduced the risk of cognitive impairment. Such findings will help to understand better the mechanism of cognitive function for future plans to screen, prevent and treat this decline. However, further studies are required to predict the risk factors for cognitive impairment as population ages.

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