Background

The global ageing population is rapidly increasing. Sixty five percent of the older population are women and experience higher rates of morbidity and disability due to longer life expectancies [1]. Defined as an involuntary loss of urine, urinary incontinence (UI) is one of the main causes of poor health in old age and is often perceived as a ‘women

incontinence among urban older women (<0.05), as well as among rural older women (<0.05). Within both populations, Malay older women made up majority of the UI groups (47.8% in urban, 88.6% in rural), followed by the Chinese and Indians. The direction of association is further explored in the regression analysis. Chronic constipation (47.2% UI with constipation; 20.5% UI without constipation, < 0.001) and physical performance; functional mobility (<0.05) and muscle strength (< 0.001) were also found to be significant among rural older women. When compared to continent older women, those with UI took a longer time to complete the TUG test which implied impairment in mobility and dynamic balance. Similarly, older women with UI had lower handgrip strength implying less

Table 2 Association between variables and incontinence in urban population

Variable	Total	Urban n (%)		*P*-Value
	431	UI 69 (16.0)	Non-UI 362 (84.0)	
Age (years) (mean ± s.d.)	71.2 ± 5.4	71.1 ± 5.5	71.2 ± 5.4	0.812[+]
Age Range				0.678[#]
60–69	194	32 (46.4)	162 (44.8)	
70–79	199	32 (46.4)	167 (46.1)	
≥ 80	38	5 (7.2)	33 (9.1)	
Ethnicity				0.042*[#]
Malay	151	33 (47.8)	118 (32.6)	
Chinese	244	30 (43.5)	214 (59.1)	
Indian	36	6 (8.7)	30 (8.3)	
Marital Status				0.518[#]
Married	229	37 (53.6)	192 (53.0)	
Unmarried/Widowed/Divorced	202	32 (46.4)	170 (47.0)	
Education				0.637[#]
≤ 6 Years	316	49 (71.0)	267 (73.8)	
> 6 Years	115	20 (29.0)	95 (26.2)	
Smoking History				0.312[#]
Smoker	7	2 (2.9)	5 (1.4)	
Non/Past Smoker	424	67 (97.1)	86 (98.6)	
BMI (kg/m				

Risk factors of UI within urban and rural populations

The regression analysis included variables that were significant in this study as well as those reported to be significant in past studies (age, ethnicity, education, BMI, morbidity, history of falls, chronic constipation, MCI and physical performance). Ethnicity was a non-binary, categorical variable. Malay ethnicity was selected as the reference variable as it is the largest ethnicity in Malaysia. Tables 4 and 5 depict the results of the binary logistic regression for urban and rural populations respectively. Results among the urban population found older women of Chinese ethnicity to be 0.6 times less likely to have UI as compared to Malay ethnicity [OR 0.430, 95% C.I: 0.224–0.825, = 0.011]. In the rural setting, older women

with chronic constipation [OR: 3.384, 95% C.I: 1.556–7.360, = 0.002] were found to be at risk of UI by 3.4 times compared to those without constipation.

Quality of life of older women within urban and rural populations

Table 6 depicts the quality of life of the urban and rural older women with incontinence based on the KHQ. Both urban and rural populations expressed positive general health perception in Part 1 (< 0.05). However, 96% of the participants reported that daily life was impacted due to UI by at least 'a little'. The findings in Part 2 of the KHQ showed that older women in the rural setting had higher scores for all the domains of QoL.

and sleep disturbances (< 0.05). Part 3 found no significant difference between the two populations, implying that both rural and urban older women experienced similar levels of incontinence severity. Though the incontinence related symptom of 'bladder pain' was statistically significant with it affecting the urban population, the credibility of significance is questionable with the close to 0 mean score.

Discussion

To the best of our knowledge, this study is the first of its

Chronic constipation was found to increase the risk of incontinence by 3.4 times among older women in our study. Similarly, chronic constipation was reported to be a predictor of UI among women residing in a rural community in India [21]. This is in agreement with findings of past studies which correlated UI with the increase in intra-abdominal pressure among individuals with severe constipation [5, 32, 33].

Falling under the mnemonic 'DIAPPERS', chronic constipation due to stool impaction is a treatable cause of UI with the right medication and lifestyle modification [5]. Poor physical function namely functional mobility and strength has been strongly correlated with increased likelihood of incontinence, especially among older adults who are home-bound or living in institutions [34]. Decline in physical performance is associated with increased risk of falls and it hampers the ability to carry functional tasks which is a vital aspect of successful toileting [35, 36]. The participants in our study were community dwelling and considerably independent in terms of daily functionality, which could explain why physical function was not found to be a significant risk factor of UI.

The existence of urban-rural gradient among incontinent has been established whereby women from urban communities perceived incontinence to negatively

impact quality of life and were more likely to seek treatment as compared to those in rural communities [37]. In our study, older women from both populations equally perceived impact of UI in general between little to moderate. In regard to specific domains of daily life, it impacted the rural population more. It is possible that older women from rural populations with lower education levels are ignorant or have less understanding of UI as a health condition. They probably perceived themselves to have decent wellbeing despite experiencing limitations in multiple facets of daily living due to incontinence [38, 39].

In our study, older women in the rural setting dealt with higher limitations in role, social and physical aspects of daily living due to incontinence. It could be inferred that inability to execute habitual tasks may cripple one's sense of purpose, resulting in a loss of personal identity [40]. Social life plays an important role among rural non-institutionalised older adults and 'social exclusion' can be hazardous to the community [41, 42]. Maintaining strong ties within the community such as frequent social calls among friends and relatives are integral components of daily living in the rural setting and is less valued within urban populations [43]. It could be deduced that rural older women were more sociable than urban hence experiencing more impact on

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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