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SOCIODEMOGRAPHIC AND HEALTH-RELATED DETERMINANTS FOR ACTIVITY PARTICIPATION AMONG PATIENTS RECEIVING HAEMODIALYSIS IN COMMUNITY-BASED CENTRES IN SINGAPORE

Ms Qu XiaoJie, Ms Yan Hua, Dr Xu Tianma, Dr Behram Ali Khan

ABSTRACT

Introduction: Activity participation is essential for chronic disease prevention and ensuring quality of life. Identifying determinants for activity participation would support health interventions that encourage physical exercise and uptake of preventive health measures. Patients with end-stage kidney disease (ESKD) receiving haemodialysis (HD) were often less active than healthy individuals.

Method: A cross-sectional clinical audit was conducted among HD patients who received treatment from community-based dialysis centres in Singapore to identify determinants of activity participation. Eighty patients answered interviewer-administered questionnaire to provide information on sociodemographic and health-related determinants. Activity participation was measured using the Activity Card Sort Singapore Version and recorded as percentage of activity retained. Within each determinant of participation, activity retained was compared across the categories using either Student's T-test, one-way ANOVA with post-hoc and Bonferroni correction or Kruskal-Wallis test.

Result: Older patients had lower instrumental activities of daily living (IADL) retained (38.5 percent ± 24.3 percent) than younger patients (66.4 percent ± 17.2 percent, p=0.003). Females had higher high-demand leisure activity retained (21 percent ± 17.3 percent) than males (12.7 percent ± 10.7 percent, p=0.013). Patients' mobility status was associated with significantly different IADL (p<0.001), and social activity (p=0.037) retained. Blurred vision or impaired hearing were associated with lower IADL retained (p=0.01 and 0.04 respectively).

Conclusion: The clinical audit has identified sociodemographic and health determinants that affect HD patients' participation in activities. Future health interventions should aim at encouraging activity participation among high-risk groups such as elderly, individuals with limited mobility or sensory impairment.

Keywords: ACS-SG, end-stage kidney disease, haemodialysis, health-related determinant, sociodemographic

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MS QU XIAOJIE
Department of Medical Services, The National Kidney Foundation Singapore, Singapore

MS YAN HUA
Department of Medical Services, The National Kidney Foundation Singapore, Singapore

DR XU TIANMA
Department of Health and Social Sciences, Singapore Institute of Technology, Singapore

DR BEHRAM ALI KHAN
Department of Medical Services, The National Kidney Foundation Singapore, Singapore
Yong Loo Lin School of Medicine, National University of Singapore, Singapore

INTRODUCTION

Activity participation is essential for ensuring the quality of life (QoL).[1-2] Physical inactivity is a well-established risk factor for non-communicable diseases.[1] Studies have demonstrated that active participation in leisure-time physical activities was associated with reduced risk of coronary heart disease[3] and diabetes.[4] The ability to participate in instrumental activities of daily living (IADL) may affect individuals' uptake of preventive health measures such as chronic disease screening, immunisation, and reduction of antimicrobial resistance. Studies have demonstrated that impaired instrumental activities of daily living were associated with low vaccine uptake[5] and increased antibiotic consumption.[6] Social participation was identified as an important factor for improving quality of life and cognitive functioning among Chinese with chronic medical conditions.[2] Participation in social activities was also found to be associated with improved QoL among the Korean population.[7]

Singapore has experienced increased burden of chronic diseases over the past years with the age-standardised prevalence of hypertension increased from 21.9 percent in 2017 to 31.7 percent in 2020.[8] Despite efforts to encourage physical exercise, the proportion of Singaporeans engaging in sufficient physical activity fell from 80.9 percent in 2017 to 76.8 percent in 2020.[8] The enrolment rate for preventive health measures such as disease screening remained unsatisfactory with only 35.1% of eligible woman participated in mammogram screening and 27.3% of the eligible residents participated in colorectal cancer screening.[9] Local studies have examined sociodemographic factors associated with physical inactivity,[10-13] including the impact of demographic, psychosocial, and cultural background on social participation.[14,15] However, local evidence of the impact of these determinants on IADL participation has been limited. The influence of health-related determinants, such as mobility, hearing, vision, and presence of pain on activity participation has been unclear.

Patients with end-stage kidney disease (ESKD) receiving haemodialysis (HD) often experience participation restrictions in areas such as IADL, leisure (including

leisure time physical activities), and social activities.[16-19] To gain a comprehensive understanding of the impact of sociodemographic and health-related determinants on activity participation, a clinical audit was conducted among patients who have been receiving HD treatment from the National Kidney Foundation (NKF). NKF is a non-profit organisation in Singapore with 41 community-based dialysis centres. The information generated from the audit would support health interventions to encourage activity participation among HD patients, thus improving their QoL and preventing the onset of other chronic diseases.

METHODOLOGY

In June 2022, patients from three NKF dialysis centres were invited to participate in the interviews conducted by occupational therapy students from the Singapore Institute of Technology (SIT), a public autonomous university. Patients were selected using convenience sampling. Interviewers approached patients who were able and willing to respond to the interview. Written consent was obtained from the patients prior to the interview.

Data Collection

Patients' sociodemographic and health-related information were collected using an interviewer-administered, structured questionnaire. Activity participation was measured using the Activity Card Sort Singapore Version (ACS-SG).[20] The ACS-SG required patients to sort photographs depicting 85 activities into four categories that best describe their level of participation. The four categories were: i) not done since age 60; ii) do now; iii) do less; and iv) given up.

For each activity listed in the ACS-SG, two activity scores (i.e., current and previous activity scores) were obtained. No point was assigned to both scores if participants selected "not done since age 60". One point was assigned to both scores if participants selected "do now". A half point was assigned to the current score and one point was assigned to the previous score if the participant selected "do less". Lastly, zero points were assigned to the current score and one point was assigned to the previous score if the participant selected "given up". Subsequently, the 85 activities were grouped into four domains: i) IADL; ii) low-demand leisure activity; iii) high-demand leisure activity; and iv) social activity. A description of activities in each domain can be found in **Appendix Table I**. For each domain, activity retained (%) was calculated by the following formula:

(Sum of current activity score / Sum of previous activity score) *100 percent

The sociodemographic determinants examined included age, gender, language, and living arrangement. Health determinants examined included mobility status, self-care status, use of a walking aid, hearing, vision, presence of pain, and presence of pre-existing medical conditions, which included diabetes mellitus (DM), hyperlipidaemia, and hypertension. Details of these determinants can be found in **Table I**.

Data Analysis

The number and proportion of participants in each category of the determinant for activity participation was determined. Activity retained was summarised as mean with standard deviation (SD) for normally distributed data and as median with interquartile range (IQR) for skewed data. Within each determinant of participation, activity retained was compared across the categories. For binary determinants, comparison was made using Student's T-test. For determinants with more than two categories, comparison was made using one-way ANOVA if the data was normally distributed. If activity retained differed significantly across the categories of a particular determinant based on the result from one-way ANOVA, pairwise comparison with Bonferroni correction was conducted. For skewed data with multiple categories, the Kruskal-Wallis test was used. Participants with nil response for a particular determinant were excluded from analysis for that determinant. Statistical significance was defined as p-value <0.05. All statistical analyses were performed using IBM SPSS® statistics for Windows version 26.0.

RESULTS

A total of 80 patients were interviewed. The sociodemographic and health-related characteristics of the participants are summarised in **Table I**. Briefly, the majority of participants (N=64, 80 percent) were older than 60 years old and stayed with their families (N=64, 80 percent). There were more males (N=42, 52.5 percent) than females. More than half of the participants (N=42, 52.5 percent) spoke Mandarin or other Chinese dialects. While 65 percent (N=52) of the participants were able to ambulate independently, 53.8 percent (N=43) required walking aid. Seventy-five percent of the participants (N=60) were able to perform self-care activities independently. For other health-related determinants, 36.3 percent (N=29) of the participants experienced pain, 18.8 percent (N=15) had blurred vision, and 16.3 percent (N=13) had impaired hearing. More than half of the participants had pre-existing DM (66.3 percent), 11.3 percent had pre-existing hypertension, and 46.3 percent had pre-existing hyperlipidaemia.

Impact of Sociodemographic Determinants

Activities retained (%) were summarised and compared across the categories within each determinant; the results are presented in **Table II**. It was found that participants aged 60 years old and below had significantly higher IADL retained (66.4 percent ± 17.2 percent) than those aged 71 to 80 (38.5 percent ± 24.3 percent, p=0.003). Participants staying alone had higher IADL retained (73.1 percent ± 16.6 percent) than those living with family (47 percent ± 24.3 percent, p=0.009) and those living with helper/friends (34.9 percent ± 25.9 percent, p=0.006). Females had higher high-demand leisure activity retained (21 percent ± 17.3 percent) than males (12.7 percent ± 10.7 percent, p=0.013). Participants who spoke different languages did not have significant differences in activity retained.

Appendix Table I: Type of activities in each of the four domains

Instrumental activities of daily living	Low-demand leisure activity	High-demand leisure activity	Social activity
1) Shopping in a store 2) Shopping for groceries 3) Dishes 4) Laundry 5) Garden maintenance 6) Taking out the trash 7) Cooking meals 8) Mending 9) Preserving food 10) Household maintenance 11) Fixing things around the house 12) Driving 13) Pumping petrol 14) Car maintenance (e.g., car wash) 15) Taking care of pet(s) 16) Paying bills 17) Managing investment 18) Resting 19) Hairdressing 20) Childcare 21) Ironing 22) Preparing hot beverage 23) Taking money from an ATM machine 24) Using public transportation 25) Topping up EZ-link card 26) Using postal services	1) Spectator sports 2) Window Shopping 3) Cooking/Baking as a hobby 4) Sewing (e.g., clothes) 5) Hand crafts 6) Table games (e.g., chess, checkers, cards) 7) Flower arranging 8) Computer 9) Collecting (e.g., currency, stamp, antique) 10) Puzzles (e.g., jigsaw, crossword) 11) Photography 12) Drawing/painting 13) Home decorating 14) Playing musical instrument 15) Reading newspapers/magazines/books 16) Engaging in religious activities 17) Writing (letter writing/creative writing/journal 18) Bird watching 19) Going to places of interest in Singapore 20) Attending concerts/theatre 21) Watching movies at Theatre or DVD/VCD at home 22) Watching television 23) Listening to music 24) Sitting and thinking 25) Knitting/crocheting 26) Gambling 27) Singing karaoke 28) Playing mahjong	1) Swimming 2) Bowling 3) Golfing 4) Walking 5) Running/jogging/brisk walking 6) Playing racket games (e.g., badminton, table tennis) 7) Cycling 8) Games in the park (e.g., frisbee, gate ball) 9) Camping 10) Canoeing/boating/sailing 11) Fishing 12) Gardening/growing flowers 13) Practising Tai-chi/Qigong 14) Other exercises	1) Studying for personal advancement 2) Travelling 3) Parties/picnics/barbecue 4) Family gathering 5) Talking on the phone 6) Visiting family/ friends who are ill 7) Visiting with friends 8) Eating at a restaurant/food court/ hawker centre 9) Dancing 10) Going to places of worship 11) Volunteer work 12) Going to children's/grandchildren's activity 13) Storytelling with children 14) Marriage/relationship 15) Entertaining at home or club 16) Visiting the cemetery/Paying respect to ancestors 17) Joining competitions

ATM: automated teller machine, DVD: digital video disc, EZ-link card: contactless smart card used for public transportation in Singapore, VCD: video compact disc

Table I: Summary of the sociodemographic and health characteristics of participants

Determinants of activity participation	Number of participants
Age Group (year)	
≤60	16 (20.0%)
61-70	27 (33.8%)
71-80	24 (30.0%)
>80	13 (16.3%)
Gender	
Female	38 (47.5%)
Male	42 (52.5%)
Language spoken	
English	29 (36.3%)
Mandarin	36 (45.0%)
Malay	9 (11.3%)
Other Chinese dialects	6 (7.5%)
Living arrangement	
Staying alone	9 (11.3%)
Staying with family	64 (80.0%)
Staying with helper/friend	7 (8.8%)
Mobility	
Independent	52 (65.0%)
Assisted walking >10 metres	4 (5.0%)
Assisted walking <10 metres	24 (30.0%)
Use of a walking aid	
No	37 (46.3%)
Yes	43 (53.8%)
Self-care status	
Independent	60 (75.0%)
Assisted	20 (25.0%)
Presence of pain	
No	48 (60.0%)
Yes	29 (36.3%)
Nil response	3 (3.8%)
Vision	
Functional without glasses	24 (30.0%)
Functional with glasses	41 (51.3%)
Blurred vision	15 (18.8%)
Hearing	
Intact	66 (82.5%)
Impaired	13 (16.3%)
Nil response	1 (1.3%)
Diabetes Mellitus	
No	27 (33.8%)
Yes	53 (66.3%)
Hypertension	
No	9 (11.3%)
Yes	71 (88.8%)
Hyperlipidaemia	
No	43 (53.8%)
Yes	37 (46.3%)

Table II: Activity retained (%) summarised and compared across the categories within each determinant of activity participation

Determinant of activity participation	Instrumental activities of daily living retained (%)		Low-demand leisure activity retained (%)		High demand leisure activity retained (%)		Social activity retained (%)	
	Mean ± SD OR Median (IQR)	*P-value*	*Mean ± SD OR Median (IQR)*	*P-value*	*Mean ± SD OR Median (IQR)*	*P-value*	*Mean ± SD OR Median (IQR)*	*P-value*
Age Group (year)		0.004*		0.759		0.664		0.351
≤60	66.4 ± 17.2#		47.6 ± 17.6		17 ± 12		30.9 ± 12.4	
61-70	50.8 ± 24.9		48.7 ± 20.2		14.6 ± 14.9		32 ± 11.6	
71-80	38.5 ± 24.3#	#0.003*	42.7 ± 23.4		16.3 ± 15.3		26.8 ± 14.1	
>80	42.5 ± 26.1		48.3 ± 23.3		20.9 ± 17		26.1 ± 11.5	
Gender		0.89		0.872		0.013*	29.2 ± 12.6	0.97
Female	48.5 ± 24.8		46.2 ± 19.9		21 ± 17.3		29.2 ± 12.6	
Male	49.3 ± 25.9		47 ± 22.2		12.7 ± 10.7		29.3 ± 12.7	
Language spoken		0.924		0.969		0.272		0.334
English	51.4 ± 25.1		48.1 ± 21.8		12.6 ± 10.1		31.8 ± 11.1	
Mandarin	47.2 ± 26.9		46 ± 20.9		18.5 ± 16.2		27.7 ± 13.8	
Malay	49.2 ± 25.1		45.5 ± 24.3		17.5 ± 19.3		31.6 ± 13.2	
Other Chinese dialects	46.6 ± 20.9		44.7 ± 17.1		23.1 ± 15.7		23.4 ± 9.4	
Living arrangement		0.004*		0.326		0.648		0.905
Staying alone	##73.1 ± 16.6#		55 (50, 68.8)		10 (7.7, 25)		30.9 ± 8.4	
Staying with family	47 ± 24.3#	#0.009	41.9 (30.4, 62.2)		11.1 (7.1, 20)		29.2 ± 13	
Staying with helper/friend	##34.9 ± 25.9	##0.006	46.4 (20.1, 54.4)		25 (7.1, 35.4)		28.1 ± 14.4	
Mobility		<0.001**		0.121		0.023*		0.037*
Independent	##60.8 ± 21.1#		50 ± 21.1		18.7 ± 14.7		31.7 ± 11#	
Assisted walking >10 metres	36.1 ± 11.7#	#0.049	44.7 ± 15.4		26.9 ± 17.4		30.5 ± 10	
Assisted walking <10 metres	##25.2 ± 15.8	##<0.001**	39.4 ± 20.5		10.3 ± 12.5		23.8 ± 14.7#	#0.032*
Use of walking aid		<0.001**		0.147		0.333		0.106
No	64.6 ± 19.1		50.3 ± 20.2		18.3 ± 14.3		31.7 ± 10.8	
Yes	35.4 ± 21.9		43.4 ± 21.4		15.1 ± 15		27.2 ± 13.7	
Self-care status		<0.001**		0.054		0.058		0.069
Independent	57.1 ± 21.6		49.2 ± 20.6		18.4 ± 14.7		30.8 ± 11.5	

Assisted	24.4 ± 19.1		38.8 ± 20.7		11.2 ± 13.8		24.9 ± 14.8	
Presence of pain		0.327		0.89		0.88		0.428
No	52.3 ± 25.4		47.6 ± 22.2		16.7 ± 14.1		30.5 ± 12.3	
Yes	52.3 ± 25.4		47.6 ± 22.2		16.7 ± 14.1		30.5 ± 12.3	
Vision		0.011*		0.995		0.538		0.825
Functional without glasses	59.5 ± 24.4#		46.7 ± 22.5		13.8 ± 12.2		29.9 ± 11	
Functional with glasses	47.6 ± 24.9		46.4 ± 21.1		18.1 ± 15.7		29.6 ± 13	
Blurred vision	35.4 ± 21.4#	#0.01*	47 ± 19.7		17.1 ± 16		27.5 ± 14.3	
Hearing		0.04*		0.715		0.402		0.027*
Intact	51.6 ± 24.6		46.9 ± 20		16.8 ± 14.4		30.4 ± 12.1	
Impaired	35.8 ± 26.3		44.6 ± 27		13.1 ± 14		22.1 ± 12.4	
Diabetes mellitus		0.042*		0.846		0.613		0.738
No	56.9 ± 22		47.2 ± 23.2		15.4 ± 11		30 ± 11.7	
Yes	44.8 ± 26		46.3 ± 20		17.2 ± 16.4		28.9 ± 13.1	
Hypertension		0.405		0.602		0.699		0.322
No	55.5 ± 29.8		50.1 ± 25.1		18.4 ± 14.6		33.2 ± 12.8	
Yes	48.1 ± 24.7		46.2 ± 20.6		16.4 ± 14.8		28.8 ± 12.5	
Hyperlipidaemia		0.596		0.182		0.377		0.281
No	47.5 ± 23.7		43.7 ± 21.4		15.3 ± 14.9		27.9 ± 13.1	
Yes	50.5 ± 27.2		50 ± 20.3		18.2 ± 14.5		30.9 ± 11.9	

**p-value < 0.05, **p-value < 0.001*
Categories abbreviated with the same number of "#" were pairs with significantly different activity retained based on post-hoc analysis.
IQR; inter-quartile range, n: number of participants, SD: standard deviation

Impact of Health Determinants

Participants who were independent in ambulation had a higher percentage of IADL retained (60.8 percent ± 21.1 percent) than those who could walk more than 10 metres with assistance (36.1 percent ± 11.7 percent, p=0.049) and those who could walk less than 10 metres with assistance (25.2 percent ± 15.8 percent, p<0.001). Participants who did not need a walking aid had a significantly higher percentage of IADL retained (64.6 percent ± 19.1 percent) than those who needed a walking aid (35.4 percent ± 21.9 percent, p<0.001). Those who were independent in ambulation also had a significantly higher percentage of social activity retained (31.7 percent ± 11 percent) than those who could walk less than 10 metres with assistance (23.8 percent ± 14.7 percent, p=0.032). Although there has been a significant difference across the three categories of mobility for high-demand leisure activity retained (p=0.023), the pairwise comparison did not identify any pairs with significant differences. Additionally, participants who were able to perform self-care independently had higher IADL retained (57.1 percent ± 21.6 percent) than those who needed assistance (24.4 percent ± 19.1 percent, p<0.001).

Participants with functional vision without glasses had significantly higher IADL retained (59.5 percent ± 24.4 percent) than those with blurred vision (35.4 percent ± 21.4 percent, p=0.01). Participants with intact hearing had significantly higher IADL retained (51.6 percent ± 24.6 percent) than those with impaired hearing (35.8 percent ± 26.3 percent, p=0.04). Participants with intact hearing also had higher social activity retained (30.4 percent ± 12.1 percent) than those with impaired hearing (22.1 percent ± 12.4 percent, p=0.027). Participants without pre-existing DM had higher IADL retained (56.9 percent ± 22 percent) than those with pre-existing DM (44.8 percent ± 26 percent). The presence of pain did not affect activity retained in any of the domains. Low-demand leisure activity retained was not affected by the health determinants analysed.

DISCUSSION

While local studies have examined the impact of sociodemographic determinants on activity participation, the role of health determinants was less clear. This audit has showed that both sociodemographic and health-related determinants can significantly affect activity participation among HD patients. Future health interventions aimed at improving activity participation should consider not only the patients' sociodemographic background but also their underlying health conditions, which might contribute to inactivity.

Impact of Sociodemographic Determinant

The result from the audit suggested that older HD patients had lower IADL retained. This observation was consistent with both local and overseas studies that have demonstrated that older adults were more likely to experience restricted instrumental activity participation and were more physically inactive.[10,11,21,22] IADLs are important in supporting participation in preventive healthcare programmes such as disease screening. With restricted IADLs, such as taking public transport and topping up one's transport card, older adults may face increased difficulties in participating in preventive healthcare programmes that require travelling. Indeed, transportation has been cited as a major barrier to healthcare access.[23] The finding from the audit has reaffirmed the need to foster active participation among older HD patients such that their access to healthcare services will not be hindered. Motamed-Jahromi M et al has proposed a conceptual framework for designing interventions aimed at improving elderly participation in IADLs.[24] The framework adopts a multicomponent approach that focuses on creating an age-friendly environment and providing targeted training to the elderly.[24] This framework could serve as a starting point for healthcare institutions like NKF to design comprehensive health interventions that encourage participation among elderly patients.

It was also observed that female participants had higher high-demand leisure activity retained than male participants. This was inconsistent with both local and overseas findings, which showed that females were less active than males, especially in leisure-time activity.[11,25] The differences in outcomes could partly be explained by the fact that the current audit was done among patients receiving HD while both local and overseas studies were conducted among the general populations. This difference suggested that patients with chronic medical conditions may exhibit different patterns of activity participation as compared to the general population. Thus, it may be worthwhile for future studies to consider investigating the determinants of activity participation among patients with chronic conditions to support more targeted health programmes. The gender difference observed in the current audit has highlighted the need to consider gender-differentiated interventions to promote participation in physical activities. For example, a prospective study conducted by Salles-Costa R et al has suggested that males preferred group sports while females were more likely to perform individual physical activities requiring less strength.[26] It may be meaningful to consider these differences when designing exercise and fitness programmes.

Impact of Health Determinants

Mobility status has been suggested as having a significant impact on activity retained among HD patients, affecting three of the activity domains analysed. While there has been a lack of local evidence, this finding was unsurprising as overseas research has demonstrated that individuals with limited mobility were less active and not meeting the requirement for recommended physical exercise.[27] Findings from the audit were also consistent with existing evidence that has demonstrated that vision or hearing impairment was associated with reduced activity participation.[28,29] Despite the physical and psychological benefits of activity

participation for individuals with limited mobility or disability, guidelines on the topic have been scarce. [30,31] In fact, visual impairment may result in exclusion form physical activity interventions.[32,33] As such, it is reasonable for HD care providers to place more emphasis on encouraging activity participation among individuals with limited mobility or sensory impairment. A systematic review with meta-analysis by Sweeting J et al has reported that activities such as tai-chi, or dance can have positive impact on those with visual impairment and thus could be considered as part of health intervention programmes.[32] Another reasonable strategy to consider would be to encourage individuals with mobility issues to seek professional advice on the suitable mobility device as a qualitative study done in Singapore by Lim PY et al has highlighted the benefits of mobility scooters in supporting their users' occupational performance and engagement in the community.[34]

The audit has also demonstrated that patients without pre-existing DM had higher IADL retained than those with DM. This finding is consistent with a Singapore study done by Malhotra C et la, which showed that DM was significantly associated with limited ADL.[35] Similar findings were also seen in both Asian and non-Asian populations.[36,37] One Chinese study suggested that high level physical activity may protect against ADL decline among the elderly with type 2 DM, further highlighting the benefits of physical exercise among DM patients.[37] Besides common barriers such as lack of time and infrastructure, a multicentre cross-sectional study done in Argentina and a qualitative study done in India have also highlighted that DM patients experienced social barriers when participating in physical exercises.[38,39] Some DM patients reported that they felt uncomfortable and judged when exercising in the public.[39] Thus, it may be reasonable for healthcare institutions to form exercise groups among HD patients with similar medical backgrounds so as to create an conducive environment that allows the patients to support and encourage one another to participate in physical exercises.

The main advantage of the audit was the application of ACS-SG, which has been adopted for use in Singapore. This allowed for the capturing of more accurate information that is reflective of the Singaporean context. Furthermore, face-to-face interviews conducted during the audit has provided interviewers opportunities to explain the questionnaire to the patients, thus resolving potential misunderstandings that could lead to inaccurate answers.

The audit had several limitations. First, being a cross-sectional audit, the temporal relationship between the determinants of activity participation and activity retained cannot be clearly established. Since the ACS allowed for the capturing of change in activity retained over time, future studies could consider a longitudinal design. Second, the audit used convenience sampling method, which could result in a sample that was not representative of the HD patients from NKF. Since the participants were approached by interviewers based on the interviewers' own discretion, there was a potential for selection bias such that only patients who were more engaging and sufficiently well to respond to the questionnaire were included in the audit. Furthermore, the audit was conducted among only 80 patients, resulting in a relatively small sample size. Despite these limitations, the information gathered from this audit is nevertheless meaningful in supporting HD patients with more appropriate community-based services, such as rehabilitation therapy programmes and wellness programmes. Findings and hypotheses generated from the audit can also serve as a starting point for future large-scale studies, which should consider employing random sampling methods.

CONCLUSION

The audit has demonstrated the need for comprehensive understanding about both sociodemographic and health-related determinants for activity participation among patients with chronic medical conditions. Health institutions could adopt a comprehensive and multicomponent framework when designing health interventions that encourage participation among the elderly. Gender-differentiated interventions could be considered to improve participation in leisure time physical activities. Emphasis should be placed on encouraging activity participation among patients adversely affected by their health conditions such as those with limited mobility, impaired vision or hearing, and patients with pre-existing DM.

With an ageing population, Singapore has seen an increase in the burden of chronic diseases. While it is important to prevent onset of chronic disease among healthy population, it is also essential to ensure patients living with chronic diseases remain active so that they can continue to enjoy a meaningful life. The findings from this audit have provided insight on sociodemographic and health determinants that may affect activity participation, thus contributing to Singapore's effort in chronic disease management and prevention.

Author Contributorship

Dr Qu XiaoJie drafted the manuscript and prepared materials for submission. Dr Yan Hua analysed data collected and provided insight for the manuscript. Dr Xu Tianma has contributed to the conception of the project and led the team of interviewers. Dr Behram Ali Khan provided the final approval and insight for the manuscript.

Declaration of Conflicts of Interest

The authors declare that they have no conflict of interest in relation to this article

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LEARNING POINTS

- **Activity participation was adversely affected among older haemodialysis patients, patients with hearing or visual impairment, patients with limited mobility, and those with pre-existing diabetes.**
- **Removing transportation barriers, creating a supportive environment, encouraging patients with mobility issues to consider suitable mobility devices, and selecting activities with known benefits for the targeted patient groups are appropriate strategies that can be considered to improve activity participation.**
- **Gender-differentiated interventions could be considered to improve participation in leisure time physical activities.**