

APPLICATION OF CLASSIFICATION AND REGRESSION TREE (CART) ON LIFE INDEPENDENCY BASED ON FUNCTIONAL CAPACITY AND HEALTH CONDITION OF OLDER ADULTS IN KASIN VILLAGE BARENG HEALTH CENTER, MALANG

Wisodhanie Widi Anugrahanti ^{1*}, Oda Debora ¹

¹ Program Studi D-III Keperawatan STIKes Panti Waluya Malang

***Correspondence:**

Wisodhanie Widi Anugrahanti
Email: wisodhanie.widi@gmail.com

ABSTRACT

Background: The independence of life in the older adults is very dependent on the ability of the to adjust themselves to the changes that occur. Health conditions, social conditions and economic conditions are factors that have a relationship with the independence of the older adults. The Joint Health Center is one of the health service facilities in Klojen Sub-district of Malang city that provides health services for the older adults.

Objective: This study aims to identify the independence of the older adults in Kasin Village, the Work Area of the Bareng Health Center in Malang City in fulfilling daily activities based on health conditions and functional capacity of the older adults.

Methods: The design of this study was cross-sectional study with older adults' respondents aged 60 years and over in Kasin village, 142 of the Bareng Health Center working areas, taken randomly. The instruments used were IADL, AMT, GDS along with a research questionnaire. Data were analyzed by CART method using Salfold Predictive Modeller.

Results: The classification results show that 78.2% of the older adults are classified as independent. CART analysis shows that the daily menu consumed by the older adults is the best sorting variable with the highest goodness of split value of 0.1125041, use of stairs 0.1045829, daily physical activity 0.0826270, and current health perception 0.0813413. The accuracy value obtained is 95.83%, the sensitivity value is 82.88% and the specificity value is 87.10%.

Conclusion: Daily menu consumed by the older adults and current perceptions of health are variables that contribute to the independence of the older adults based on health condition factors, while the use of stairs, daily physical activity, home improvement are functional capacities that contribute to the independence of the older adults.

Key words: Classification, CART, independence, older adults.

INTRODUCTION

Ageing population in Indonesia is a crucial problem in Indonesia. The large number of the older adult's population contributes positively if the older adults have healthy, active and productive conditions, on the contrary if the older adults experience a decline in health can increase the increase in health care costs, decrease income or income, increase the

risk of disability. The lack of social and environmental support, leading to be cause of the older adults will ultimately increase the dependency ratio (Pusdatin Lansia, 2017). Data on Pusdatin Older adults in 2017 shows that the three provinces in Indonesia with the largest number of older adults are DI Yogyakarta (13.81%), Central Java (112.59%) and East Java (12.25%). Susenas data on the health condition of the

older adults in 2015 showed that the morbidity rate for the older adults in Indonesia was 28.62%, with a higher incidence in rural areas at 30.14% compared to cities at 26.89%. The dependency ratio of Indonesia's older adults' population in 2015 amounted to 13.28% meaning that every 100 people of productive age will bear around 14 older adults' people (Susenas, 2015).

Health care professionals in each health service are interested in evaluating the situation of older adults' individuals in a broad sense that supports independent living including health, functional capacity, resources, personal attributes, environment. Health and functional capacity are the factors most closely related to the independence of life in the older adults (Bravell et al, 2007; Beswick et al, 2010).

Assessment of health conditions and functional capacity can provide an overview of the characteristics of the older adults which is closely related to the independence of life of the older adults. Identification of factors related to the independence of the older adults is very useful for health practitioners, especially nursing. This is to learn new things or new methods that can be provided for the older adults in an effort to improve the health condition of the older adults (Ahlqvist, 2015). The great contribution of the peripheral hospital is one of the health service facilities for the older adults through the Posyandu program for the older adults or Posbindu by emphasizing health services in promotive and preventive efforts in addition to health services that aim to improve the quality of life of the older adults so that they can be active and develop their potential. The independence of life of the older adults is one of the factors that indicate the quality of life in the older adults. Identification of life

independence through the approach of health conditions and functional capacity of the older adults can be done by applying the Classification and Regression Tree (CART) method. The purpose of the CART method is to obtain an accurate group of data that characterizes the results of the classification. CART classification results are better than the CHAID method (Nuriyah's, 2013 in Sumartini, 2015). Anette Ahlqvist et al (2015) study shows that health conditions and functional capacities affect the independence of the older adults.

METHODS

Study Design

The study design was cross-sectional study with analytic approach.

Setting

This research was conducted in Kasin Village, the working area of the Bareng Health center in Malang City.

Research Subject

Respondents in this study were older adults aged 60 years and over, a number of 142 were taken by multistage random sampling.

Instruments

Older adult's independence is measured using Instrumental Activity Daily Living (IADL), older adult's health condition data are assessed objectively which include measurements of BP, vision function, BMI, cognitive function (AMT) and GDS. Subjective data on health includes the daily menu consumed, current health perceptions examined through questionnaires. Functional capacity data assesses physical activity undertaken by the older adults through a research questionnaire.

Data Analysis

Data were analyzed using the CART method to classify the independence of the older adults and identify the characteristics of the predictor variables namely health conditions and functional capacity that contribute to the independence of the older adults. The dependent variable used is the independence of the older adults in Kasin Village, Malang.

Ethical Consideration

Research ethics is carried out through research licensing procedures, which is letter of permission submitted to the Malang City Health Office and Malang City Health Center. Informed consent was submitted to respondents for willingness to be respondents in the study.

RESULTS

Characteristic of Respondents by Age

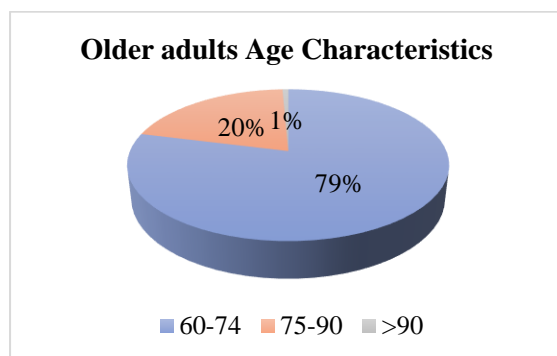


Figure 1. Characteristic of Respondents by Age in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 1 explains from 142 older adults' people, 79% or 112 older adults' people aged 60-74 years and 0.7% or 1 older adults' person > 90 years old.

Characteristic of Respondents by Gender

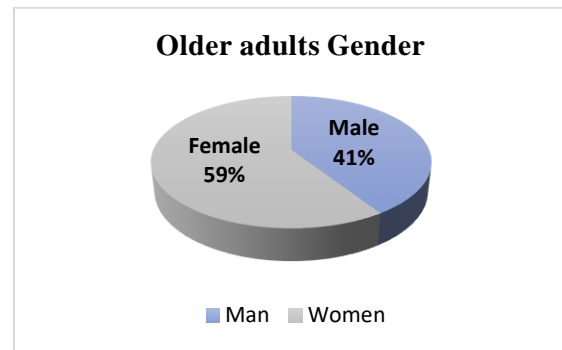


Figure 2. Characteristic of Respondents by Gender in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 2 explains from 142 older adults, 59% or 84 older adults were female and 41% or 58 older adults were male.

Characteristic of Respondents by Physical Activity

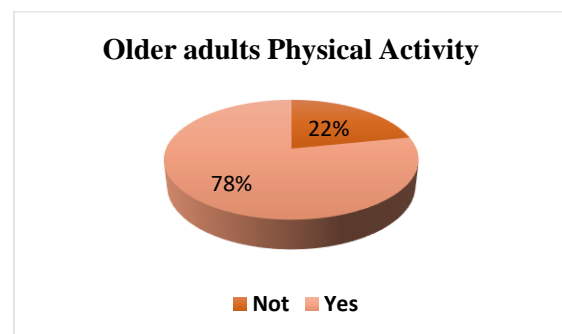


Figure 3. Characteristic of Respondents by Physical Activity in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 3 explains from 142 older adults, 78% or 111 older adults did physical activity and 22% or 31 older adults rarely did physical activity.

Characteristic of Respondents by Using Stairs

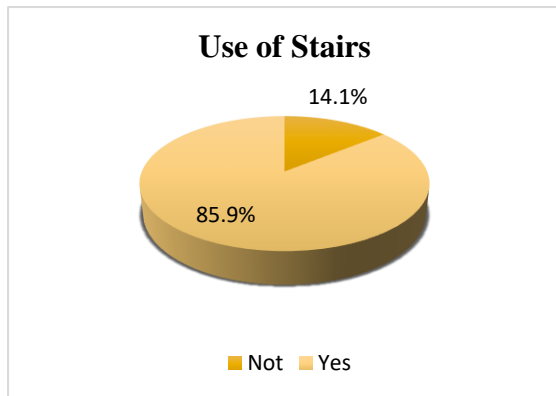


Figure 4. Characteristic of Respondents by Using Stairs in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 4 explains from 142 older adults, 85.9% or 122 older adults' people are able to use stairs and 14.1% or 20 older adults' people are unable to use stairs.

Characteristic of Respondents by Doing Home Repairs

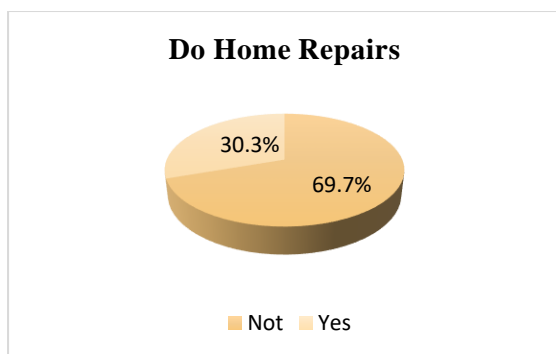


Figure 5. Characteristic of Respondents by Doing Home Repairs in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 5 explains from 142 older adults, a total of 69.7% or as many as 99 older adults did home repairs and some 30.3% or 43 older adults did not do home repairs.

Characteristic of Respondents by Managing Their Finance

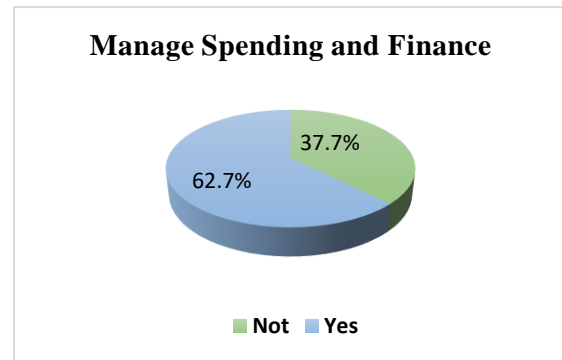


Figure 6. Characteristic of Respondents by Managing Their Finance in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 6 explains from 142 older adults, 62.7% or 89 older adults manage expenditure and finance and 37.7% older adults or 53 do not manage expenditure and finance.

Characteristic of Respondents by Having Hobby

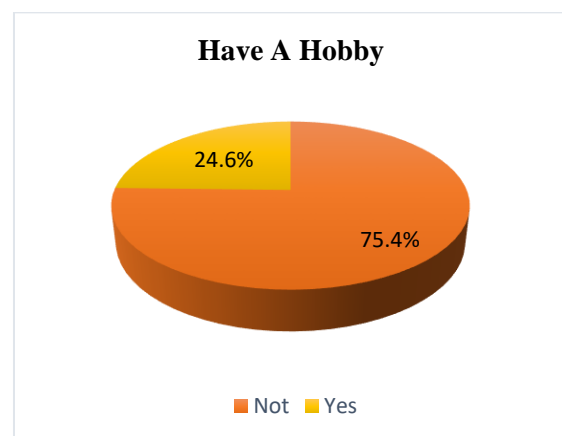


Figure 7. Characteristic of Respondents by Having Hobby in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 7 explains from 142 older adults, some 75.4% or as many as 107 older adults have hobbies and some 24.6% older adults or 35 do not have hobbies.

Characteristic of Respondents by Their Current Health Perception

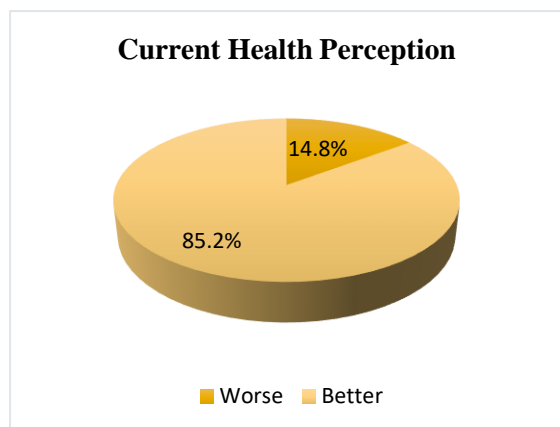


Figure 8. Characteristic of Respondents by Their Current Health Perception in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 8 explains from 142 older adults, 85.2% or 121 older adults have better perception of their current health condition and 14.8% of older adults or 21 have bad perception.

Characteristic of Respondents by Suffering from DM

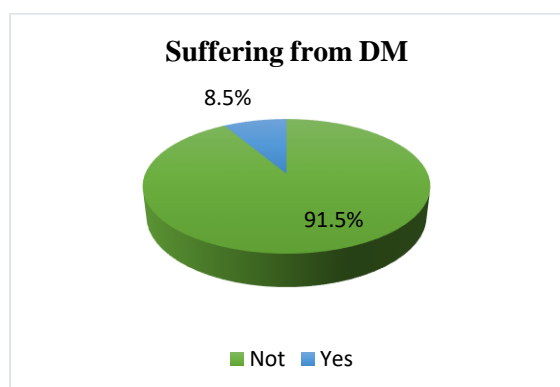


Figure 9. Characteristic of Respondents by Their Current Health Perception in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 9 explains from 142 older adults, some 91.5% or as many as 130 older adults did not suffer from DM and a number of 8.5% older adults or 12 suffered from DM.

Characteristic of Respondents by Daily Menu

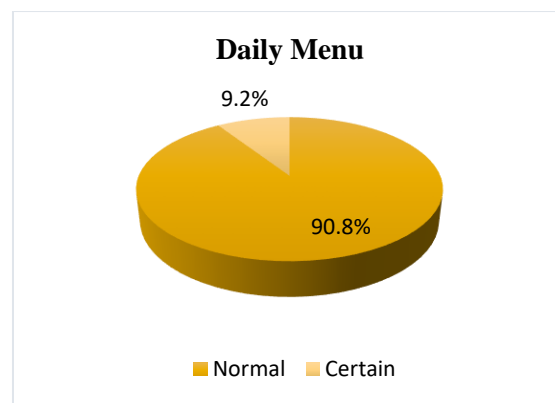


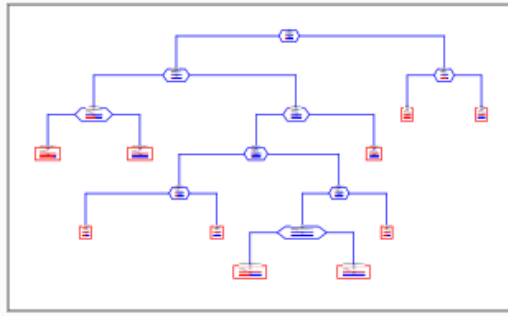
Figure 10. Characteristic of Respondents by Their Current Health Perception in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Figure 10 explains from 142 older adults' people, 90.8% or 129 older adults' people have a normal daily menu and 9.2% older adults' or 13 have a certain daily menu.

CART Analysis for Older adults Independence

This study uses a total of 142 primary data covering health conditions and functional capacity of the older adults obtained through measurements and interviews. The steps of CART analysis are carried out as follows:

Determine Optimal Tree Construction



Determination of the optimal classification tree is done by looking at the relative minimum cost as shown in table 1 as follows:

Table 1. Value of Relative Cost in Classification Trees

Tree Number	Terminal Nodes	Test Set Relative Cost	Resubstitution Relative Cost	Complexity Parameter
1**	10	0,30020± 0,07002	0,11334	0,000000
2	9	0,32345± 0,07475	0,12235	0,004526
3	8	0,38274± 0,08011	0,14938	0,013524
4	7	0,42924± 0,08634	0,18541	0,018028
5	6	0,55827± 0,09451	0,23191	0,023259
6	3	0,58152± 0,08862	0,40889	0,029507
7	2	0,77652± 0,08862	0,62191	0,106520
8	1	1,00000± 0,00000	1,00000	0,189054

The result on the table 1 showed that the optimal classification tree has 10 terminal nodes with the lowest minimum relative cost of 0.11334.

Characteristic of Terminal Nodes

1) Terminal 1 node consists of 9 older adults who are predicted to be older adults not independent. The characteristics of the older adults at this node are having a normal daily meal menu, not using stairs, not managing shopping and finances; 2)

Terminal 2 node consists of 4 older adults who are predicted as independent older adults. The characteristics of the older adults at this node are having a certain daily food menu, using the stairs, managing shopping and finances; 3) Terminal 3 node consists of 9 older adults who are predicted to be older adults who are not independent. The characteristics of the older adults at this node are having a normal daily diet, not using stairs, not doing home repairs, rarely doing physical activity every day, suffering from DM; 4) Terminal 4 node consists of 3 older adults who are predicted as independent older adults. The characteristics of the older adults at this node are having a certain daily food menu, using the stairs, doing home repairs, doing physical activities every day, not suffering from DM; 5) Terminal 5 node consists of 4 older adults who are predicted as older adults who are not independent. The characteristics of the older adults at this node are having a certain daily food menu, not using stairs, not doing home repairs, not doing physical activity, not suffering from DM, having poor health perception at this time; 6) Terminal 6 node consists of 54 older adults who are predicted as independent older adults. The characteristics of the older adults at this node are having a certain daily food menu, using the stairs, doing home repairs, doing physical activity, suffering from diabetes, having a good health perception at this time; 7) Terminal 7 node consists of 5 older adults who are predicted as older adults who are not independent. The characteristics of the older adults at this node are having a normal daily

diet, not using stairs, not doing home repairs, rarely doing physical activity, not suffering from DM; 8) Terminal 8 node consists of 41 older adults who are predicted as independent older adults. The characteristics of the older adults at this node are having a certain daily food menu, using a ladder, doing home repairs; 9) Terminal 9 node consists of 12 older adults who are predicted to be older adults who are not independent. The characteristic of the older adults at this node is a normal daily eating menu, no hobbies; and 10) Terminal 10 node consists of 1 older adult who is predicted as an independent older adult. The characteristic of the older adults at this node is having a certain daily food menu, having a hobby.

Characteristic of Independency of Older Adults

Table 2. Characteristic of Independency of Older Adults in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Dependent Older Adults	Independence Older Adults
1. Have a normal daily menu, unable use stairs, unable manage shopping and finances	1. Have a certain daily food menu, use the stairs, manage shopping and finance
2. Unable doing home repairs, rarely doing physical activity every day, suffer from DM	2. Doing home repairs, physical activity every day, do not suffer from DM
3. Do not suffer from DM, have poor health perception at this time	3. Suffered from DM, has a good current health perception
4. Do not have a hobby	4. Have a hobby

Classification Accuracy in Independency of Older Adults

Table 3. Classification Accuracy in Independency of Older Adults in the Kasin Village, the working area of the Bareng Health Center in Malang City (n = 142).

Observation Y	Prediction Y		Total
	Dependent	Independen dent	
Dependent	27	4	31
Independent	19	92	111
Total	46	96	142

$$APER = \frac{4 + 19}{142} = 16,19$$

$$Specivicity = \frac{27}{31} \times 100\% = 87,10$$

$$Sensitivity = \frac{92}{111} \times 100\% = 82,88$$

$$Accuracy = \frac{27 + 92}{142} \times 100\% = 83,81$$

DISCUSSION

CART analysis shows menu daily, Diabetes Mellitus, perception of current health condition were health condition variables that contribute to the independence characteristics of the older adults, while using stairs, managing shopping and finances, doing home repairs, doing physical activities every day, and having hobby is a functional capacity that contributes to the characteristics of the independence of the older adults in the Kasin Kelurahan, the working area of the Bareng Peripheral Hospital in Malang. Certain daily menus as the main sorting variables that contribute to the independence of the older adults reflect the efforts that the older adults can make in preventing disease in order to achieve independent living. Consumption of excessive nutrition such as energy input from carbohydrates, fats, proteins can increase blood cholesterol which can

increase the risk of cardiovascular disease (Sunu, 2017). A decrease in total energy needs in the older adults is recommended to reduce consumption of high cholesterol foods, especially animal fats that are rich in saturated fatty acids and cholesterol (Ryoto, 2012). The use of stairs as daily activity that can be done routinely and physical activity carried out every day can reduce the risk of cardiovascular disease and maintain the working system of the heart and balance blood cholesterol levels (Sunu, 2017).

SUGGESTION

Older adults should improve their quality of life by increasing healthy daily menu, use the stairs, do manage shopping and finance, do physical activities, do hobby, also have good perception of current health conditions.

REFERENCES

- Ahlqvist, A., Nyfors, H., & Suhonen, R. (2016). Factors associated with older people's independent living from the viewpoint of health and functional capacity: a register-based study. *Nursing open*, 3(2), 79-89.
- Beswick, A. D., Gooberman-Hill, R., Smith, A., Wylde, V., & Ebrahim, S. (2010). Maintaining independence in older people. *Reviews in Clinical Gerontology*, 20(2), 128-153.
- Bravell, M. E., Berg, S., & Malmberg, B. (2008). Health, functional capacity, formal care, and survival in the oldest old: a longitudinal study. *Archives of Gerontology and Geriatrics*, 46(1), 1-14.
- Indonesia Survei Sosial Economic Nasional 2015 (Modul)
- Lestari, M. W., & Weta, I. W. (2017). Status gizi lansia berdasarkan pengetahuan dan aktivitas fisik, di wilayah kerja Puskesmas Sukawati 1,

Gianyar, Bali. *Jurnal Kedokteran Kesehatan: Publikasi Ilmiah Fakultas Kedokteran Universitas Sriwijaya*, 4(2), 56-63.

- Pusat Data dan Informasi Lansia. (2017). *Analisis Lansia*. Jakarta: Kementerian Kesehatan Republik Indonesia.
- Sumartini, S. H., & Purnami, S. W. (2016). Penggunaan Metode Classification and Regression Trees (CART) Untuk Klasifikasi Rekuensi Pasien Kanker Serviks di RSUD Dr. Soetomo Surabaya. *Jurnal Sains dan Seni ITS*, 4(2).
- Sunu, U. F. S., Permadi, G., & Fenty, F. (2017). Hubungan Antara Aktivitas Fisik Dan Angka Kecukupan Gizi Makronutrien Terhadap Rasio Kolesterol Total/hdl Pada Masyarakat Pedesaan. *Journal of Pharmaceutical Sciences and Community*, 14(1), 15-24.