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PREVENTING THE PROGRESSION OF KNEE OSTEOARTHRITIS: A QUALITATIVE STUDY OF OLDER ADULTS' EXPERIENCES IN PEKANBARU, INDONESIA

Arneliwati[1*], Masrul[2], Mudjiran [3], Meri Neherta[4]

[1]Doctoral Program in Public Health, Faculty of Medicine, Universitas Andalas, Indonesia
[2]Department of Nutritional Sciences, Faculty of Medicine, Universitas Andalas, Indonesia
[3] Fakultas Ilmu Pendidikan, Universitas Negeri Padang, Indonesia
[4]Fakultas Keperawatan, Universitas Andalas, Padang, Indonesia
[1]arneliwati.kep.unri@gmail.com, masrulmuchtar@yahoo.com, mudjiran.unp@gmail.com, merineherta@nrs.unand.ac.id

Abstract
Background: *Knee osteoarthritis is a common chronic condition among older adults and is associated with disability and reduced quality of life. Efforts to prevent disease progression are strongly influenced by older adults' experiences and perceptions in managing their condition.* ***Aim:*** *This study aimed to explore the experiences of older adults in preventing the progression of knee osteoarthritis in Pekanbaru, Indonesia.* ***Methods:*** *A qualitative study with a descriptive phenomenological approach was conducted among 15 older adults aged 60–80 years diagnosed with knee osteoarthritis. Data were collected through semi-structured in-depth interviews in Pekanbaru City from March to May 2024 and analyzed using thematic analysis following Braun and Clarke's framework.* ***Results:*** *Four main themes were identified: (1) limited understanding of knee osteoarthritis and its prevention, (2) pain management strategies and adaptation of daily activities, (3) the role of family and social support in prevention efforts, and (4) physical, financial, and environmental challenges in implementing preventive behaviors. Despite limited knowledge, participants demonstrated strong motivation to prevent disease progression when adequate support was available.* ***Conclusion:*** *Older adults' experiences indicate that prevention of knee osteoarthritis progression is shaped by knowledge, adaptive capacity, and social support. These findings highlight the need for structured education and a multidisciplinary, context-sensitive approach to support preventive efforts among older adults.*
Keywords**:** *Elderly, Knee osteoarthritis, Prevention of disease progression, Experiences, In-depth interviews*

* Corresponding author : Arneliwati
Address : Padang, Indonesia
Email : arneliwati.kep.unri@gmail.com
Phone : 0812-7647-7544

INTRODUCTION

Knee osteoarthritis is one of the most prevalent degenerative joint diseases among older adults worldwide and represents a major cause of pain, disability, and reduced quality of life. Globally, it affects more than 250 million people, with prevalence increasing significantly with age, particularly among individuals aged over 65 years (Zhang et al., 2010). In general, the most prevalent health problems among older adults are non-communicable diseases, including hypertension, joint disorders, dental problems, and oral health issues, which often coexist and contribute to functional decline in later life (Amelia & Rosyid, 2025). In Indonesia, according to data from the 2018 Basic Health Research (Riskesdas), the prevalence of joint diseases among the elderly is 18.1%, with knee osteoarthritis being the leading cause of disability in the older age group (Kementerian Kesehatan Republik Indonesia, 2018). The lack of targeted and continuous physical activity can accelerate the decline of knee joint function, weaken supporting muscles, and worsen pain and movement limitations. Therefore, planned, safe, and elderly-appropriate physical activity becomes an important component in efforts to prevent and control the progression of knee osteoarthritis (Pertiwi & Sastrini, 2025).

Knee osteoarthritis is characterized by progressive damage to the articular cartilage, osteophyte formation, and synovial inflammation, resulting in pain, stiffness, and limited mobility (Hunter & Bierma-Zeinstra, 2019). The progression of this disease can lead to a significant decrease in the quality of life of the elderly, an increased risk of falls, and dependence on daily activities. The main risk factors include age, female sex, obesity, previous trauma, and repetitive activities that place excessive stress on the knee (Khanum, 2021).

Cases related to osteoarthritis are most commonly found in women, with the incidence ratio of knee OA in women compared to that in men being 2:1 (Peat et al., 2001). A study conducted on a population in Southern Sweden showed that 63.8% of OA sufferers are women (Kiadaliri et al., 2016). In Indonesia, joint disease is more frequently found in female patients (8.46%) than in male patients (6.13%) (Badan Penelitian dan Pengembangan Kesehatan, 2018).

Osteoarthritis can profoundly affect every aspect of a person's life. Ongoing pain, physical limitations, and depression can affect an individual's ability to participate in social, community, and work-related activities (Australian Institute of Health and Welfare, 2019). Osteoarthritis can result in disability if not treated appropriately (Manzoor et al., 2016). Individuals with osteoarthritis and disabilities may experience impacts on their activities, social life, spirituality, and psychological well-being, which can lead to stress and a decline in their quality of life (Farr II et al., 2013).

Progressive prevention of knee osteoarthritis has become the main focus in managing this disease, given that there is currently no therapy that can completely cure it. A comprehensive preventive approach includes lifestyle modifications, weight management, regular physical exercise, and patient education (Kolasinski et al., 2020). However, the implementation of these preventive strategies often faces various challenges, particularly related to the understanding, motivation, and ability of older adults to follow these recommendations.

Pekanbaru, the capital of Riau Province, has experienced a significant increase in its elderly population. According to data from the Pekanbaru City Health Office in 2023, older adults comprise 8.2% of the total population, with osteoarthritis being one of the most common non-communicable diseases in this group. However, in-depth research on the experiences of older adults in preventing the progression of knee osteoarthritis remains limited.

Therefore, this study aimed to explore the experiences of older adults in Pekanbaru City in preventing the progression of knee osteoarthritis, focusing on their understanding of the condition, coping and pain management strategies, perceived barriers, and the role of family and social support. By capturing these dimensions, the study seeks to provide contextual insights to inform the development of culturally appropriate and sustainable preventive strategies for knee osteoarthritis among older adults in Indonesia.

METHOD

Study Design

This study employed a qualitative design using a descriptive phenomenological approach to explore the lived experiences of older adults with genu osteoarthritis in preventing disease progression. The phenomenological approach was chosen to capture participants' meanings, perceptions, and interpretations of their daily experiences in managing their condition.

Setting and Participants

The study was conducted in Pekanbaru City, Indonesia, from October to December 2024. Participants were older adults diagnosed with genu osteoarthritis by a physician based on clinical and radiological criteria. A total of 15 participants aged 60–80 years were included in the study.

The inclusion criteria were: (1) age ≥ 60 years, (2) confirmed diagnosis of genu osteoarthritis, (3) ability to communicate in Indonesian, and (4) willingness to participate as indicated by signed informed consent. Older adults with severe cognitive impairment that could interfere with the interview process were excluded.

Sampling Technique

Participants were selected using purposive sampling with maximum variation to capture a wide range of experiences. Variations were sought in terms of age range, gender, educational level, employment status, living arrangements, and duration of living with osteoarthritis. Data saturation was achieved by the 13th participant; however, interviews were continued until 15 participants to ensure data depth and richness.

Data Collection

Data were collected through face-to-face, in-depth semi-structured interviews conducted by the first author, who acted as the primary research instrument. An interview guide was developed based on a literature review and validated by a panel of experts. Interview questions focused on participants' experiences in living with genu osteoarthritis, strategies used to prevent disease progression, perceived barriers, and sources of support.

Each interview lasted approximately 45–90 minutes and was conducted in a location convenient and comfortable for participants, such as their homes or healthcare facilities. All interviews were audio-recorded with participants' consent. Field notes were taken to document nonverbal expressions, contextual factors, and environmental conditions. Demographic and clinical characteristics were collected using a structured questionnaire to support qualitative data.

Data Analysis

Data analysis was conducted concurrently with data collection using thematic analysis following Braun and Clarke's framework. Audio recordings were transcribed verbatim, and transcripts were read repeatedly to achieve immersion in the data. Initial codes were generated inductively from meaningful units of text, which were then grouped into subthemes based on conceptual similarity. These subthemes were further refined and organized into overarching themes that captured the essence of participants' experiences. NVivo version 12 software was used to facilitate data organization and coding.

Trustworthiness

The rigor of the study was ensured using the criteria of credibility, transferability, dependability, and confirmability. Credibility was enhanced through member checking and peer debriefing. Transferability was supported by providing rich and thick descriptions of the research context and participants. Dependability was ensured by maintaining an audit trail of the research process, while confirmability was supported through reflexive journaling to document analytical decisions and minimize researcher bias.

Researcher Positionality

The primary researcher has a background in nursing and public health, with prior experience in caring for older adults with chronic conditions. To manage potential bias, reflexivity was maintained throughout the study through regular self-reflection, documentation in a researcher's journal, and discussions with co-researchers during data analysis to ensure interpretations were grounded in participants' narratives.

Ethical Considerations

This study was approved by the Health Research Ethics Committee of Riau University (No. 045/UN.19.5.1.1.8/UEPKK/2024). All participants provided written informed consent prior to participation, and confidentiality and anonymity were maintained throughout the research process.

RESULTS AND DISCUSSION

Characteristics of Study Participants

An overview of the participants' demographic and clinical characteristics is presented in Table 1.

Table 1. Characteristics of Study Participants (n = 15)

Characteristics	Category / Description	n	%
Sex	Female	9	60
	Male	6	40
Age (years)	Range	62–78	–
	Mean	68.3	–
Duration of knee osteoarthritis (years)	Range	2–15	–
	Mean	6.8	–
Living arrangement	Living alone	3	20
	Living with family	12	80

Table 1 illustrates the demographic and clinical profile of the participants. The sample was predominantly female, reflecting the higher prevalence of knee osteoarthritis among older women. Participants were in the later stages of older adulthood, with a mean age of 68.3 years, indicating that most were experiencing age-related functional changes. The duration of knee osteoarthritis varied widely, ranging from 2 to 15 years, suggesting diverse stages of disease progression and long-term adaptation experiences. Most participants had a secondary level of education, which may influence their understanding of health information and self-management strategies. The majority were not working or retired and lived with family members, highlighting the important role of family support in managing daily activities and preventing disease progression in later life.

Data analysis produced four main themes describing the experiences of elderly individuals in efforts to prevent the progression of knee osteoarthritis:

Theme 1: Limited Understanding of Knee Osteoarthritis and Its Preventive Efforts

Subtheme 1.1: Osteoarthritis perceived as a natural part of aging

Most participants had a limited understanding of knee osteoarthritis and strategies for preventing disease progression. The condition they experienced was often perceived as a natural consequence of aging or as "fate" that must be accepted, so prevention efforts were not yet seen as a primary need. A 65-year-old female participant stated:

"I do not really know what osteoarthritis is… the doctor said the cartilage in my knee has thinned due to old age." (Female, 65 years)

Subtheme 1.2: Illness perceived as fate

A similar view was shared by a 70-year-old male participant who initially considered knee pain a minor and temporary complaint.

"I used to think that knee pain was nothing serious, that it would go away on its own. However, over time, it worsened. If I had known it could be prevented earlier, maybe it wouldn't be this bad."

Subtheme 1.3: Improved understanding after health education

Nevertheless, participants who attended health education sessions demonstrated a better understanding of osteoarthritis and ways to prevent it, as stated by one participant:

"After attending a seminar at the community health center, I learned that osteoarthritis can be prevented from getting worse, for example, by doing light exercises and maintaining a healthy weight."

Theme 2: Pain Management Strategies and Adaptation in Daily Activities

Subtheme 2.1: Activity modification to reduce pain

Participants developed various strategies to manage their pain and adapt to their mobility limitations. The most common strategies included modifying daily activities, using medication, and utilizing traditional therapies. A 68-year-old female participant described the adjustments she made to her activities.

"When my knee starts to hurt, I reduce strenuous activities. I slowly ascend the stairs while gripping the railing." (Female, 68 years)

Subtheme 2.2: Use of pharmacological and traditional remedies

In addition, the use of traditional remedies and home care was a fairly common choice.

"I often use balm or cajuput oil, then apply a warm compress. Sometimes I drink herbal turmeric or temulawak drinks." (Female, 70 years)

Subtheme 2.3: Self-initiated light exercise as a preventive effort

Some participants independently developed simple exercise routines as a preventive measure.

"Every morning, I walk around the neighborhood for about 15 minutes." (Female, 66 years)

Theme 3: The Role of Family and Social Support

Subtheme 3.1: Practical and emotional support from family members

Family and social environments play important roles in motivating older adults to take measures to prevent the progression of knee osteoarthritis. Such support includes practical assistance, activity supervision and emotional support. A 72-year-old male participant explained his family's role as follows:

"The children always remind me not to get too tired… my wife prepares meals and reduces fried foods." (Male, 72 years)

Subtheme 3.2: Peer support and shared experiences

Interaction with fellow elderly people experiencing similar conditions also provides a sense of togetherness and motivation.

"At the elderly posyandu, many friends also have knee problems. We exchange information, so we don't feel alone." (Female, 69 years)

Subtheme 3.3: Limited support and feelings of isolation

However, not all participants received adequate support. Some expressed feelings of loneliness due to limited family support:

"All my children live far away… sometimes I feel like I'm facing this illness alone." (Female, 71 years)

Theme 4: Challenges and Obstacles in Implementing Prevention

Subtheme 4.1: Physical limitations and pain-related barriers

Participants faced various challenges in implementing prevention strategies, including physical, financial, and environmental factors. Physical limitations due to pain and declining knee function are the main obstacles.

"I want to exercise regularly, but sometimes my knees hurt a lot." (Male, 67 years)

Subtheme 4.2: Financial constraints in accessing healthcare

Financial constraints also affect access to healthcare and therapy.

"The doctor said physiotherapy is good, but it is expensive. One session costs 150,000 rupiah, if I do it regularly it becomes a burden." (Female, 70 years)

Subtheme 4.3: Environmental and cultural challenges

In addition, environmental factors such as the availability of elderly friendly facilities are also obstacles:

"There is no safe place for exercise for older adults here. The roads are uneven, I'm afraid of falling." (Female, 68 years)

Some participants also experienced dilemmas between following medical advice and maintaining long-standing habits or cultural values.

"The doctor said not to sit cross-legged, but when I pray and recite the Quran, I sit cross-legged. So I'm confused about which one to follow." (Male, 73 years)

DISCUSSION

This study revealed the complexity of older adults' experiences in preventing the progression of knee osteoarthritis, which aligns with the findings of previous studies in various countries (Bennell et al., 2021; Palazzo et al., 2016). A limited understanding of osteoarthritis and its prevention reflects a lack of comprehensive health education among the elderly population in Indonesia. This is consistent with the research by (Eregata et al., 2019), which showed that health literacy among Indonesian seniors remains low, especially regarding non-communicable diseases.

Pain management strategies developed by participants demonstrated good adaptability but were often not evidence-based. The high use of traditional therapies reflects the richness of local culture in health management; however, integration with modern medical approaches is needed for optimal effectiveness (Yuniarsih et al., 2024). This integration can create a more holistic care model that respects cultural values while improving patient health outcomes (Cahya et al., 2025)

The role of family and social support found in this study underscores the importance of a holistic approach to osteoarthritis management. Social support has been shown to correlate positively with adherence to prevention programs and quality of life among older adults with chronic illnesses (Rodriguez-Hernandez et al., 2021). Strong support from family and friends can improve patients' health perceptions and physical function, thereby enhancing their overall quality of life (Ilori et al., 2016).

Implications for Clinical Practice

The findings of this study provide important contributions to the development of clinical practice and the formulation of health policies oriented toward the needs of older adults. First, there is a need for structured, ongoing, and easily understood health education programs on knee osteoarthritis and efforts to prevent its progression. Such education should be tailored to the educational level, physical condition, and cultural background of older adults in Indonesia so that health messages can be optimally received and implemented. Nurses, especially community and geriatric nurses, play a strategic role as educators in improving health literacy among older adults and their families.

Second, these findings highlight the importance of a multidisciplinary approach involving doctors, nurses, physiotherapists, and nutrition counselors, in providing comprehensive and continuous care. Interprofessional collaboration allows for the management of knee osteoarthritis to focus not only on pain control but also on improving function, independence, and quality of life for the elderly. In addition, healthcare professionals should facilitate the integration of traditional therapies that have long been used by the community with modern medicine, while still paying attention to safety, effectiveness, and scientific evidence.

Third, strengthening community-based interventions that involve families and peer support groups has the potential to increase motivation, compliance, and sustainability of preventive behaviors among the elderly. Elderly health posts (Posyandu lansia), senior exercise groups, and other community-based health activities can serve as strategic vehicles for implementing affordable and easily accessible preventive programs that are in line with the social context of older adults.

RESEARCH LIMITATIONS

This study has several limitations that should be considered when interpreting its results. First, the findings are limited to the social, cultural, and geographical context of Pekanbaru City; therefore, generalizing the results to the elderly population in other regions should be done with caution. Second, most participants had access to basic healthcare services; therefore, the experiences

of older adults in remote areas or with limited access to healthcare may not be fully represented. Third, the relatively short duration of the study did not allow for the observation of long-term changes in preventive behaviors and adaptation among the elderly.

Recommendations for Future Research

Future research is recommended to explore the effectiveness of educational interventions and prevention programs based on local culture using mixed methods designs to gain a more comprehensive understanding. Longitudinal studies are also needed to illustrate the dynamics of experiences, behavioral changes, and sustainability of OA-G prevention efforts among older adults over time. In addition, comparative research between urban and rural areas can provide broader insights into the influence of geographic, social, and economic factors on the experiences and needs of older adults with osteoarthritis genu.

CONCLUSION

The experiences of older adults in preventing the progression of knee osteoarthritis in Pekanbaru City reflect a complex process that involves limited knowledge, behavioral adaptation abilities, the role of social support, and various challenges in implementing prevention efforts. Although the elderly's understanding of osteoarthritis remains limited, they demonstrate better adaptation abilities and motivation when supported by their family, community, and healthcare professionals. The findings of this study underscore the importance of developing comprehensive and contextual health education programs supported by a multidisciplinary approach and the active involvement of family and community members.

The integration of local wisdom and traditional therapies with evidence-based practices has the potential to increase the effectiveness of osteoarthritis prevention. The implementation of community-based programs that are accessible and affordable, accompanied by improved health literacy among older adults, is expected to significantly contribute to the improved quality of life of older adults with osteoarthritis genu in Indonesia.

BIBLIOGRAPHY

De Porter, Bobbi dan Hernacki, Mike. 1992. *Quantum Learning*. Membiasakan Belajar Nyaman dan Menyenangkan. Terjemahan oleh Alwiyah Abdurrahman. Bandung: Penerbit Kaifa.

Fauziddin. 2014. Pembelajaran PAUD Bermain CerAmelia, Y. P., & Rosyid, F. N. (2025). Hubungan Antara Self Care Management

Fauziddin. 2014. Pembelajaran PAUD Bermain CerAmelia, Y. P., & Rosyid, F. N. (2025). Hubungan Antara Self Care Management. Dengan Gejala Hipertensi Pada Lansia Penderita Hipertensi Untuk Kualitas Hidup Yang Optimal. Jurnal Ners, 9(4), 6079–6083. https://doi.org/10.31004/jn.v9i4.50297

Australian Institute of Health and Welfare. (2019). Chronic musculoskeletal conditions: Osteoarthritis. AIHW. https://www.aihw.gov.au/reports/chronic-musculoskeletal.

Badan Penelitian dan Pengembangan Kesehatan. (2018). Survey Kesehatan.

Bennell, K. L., Lawford, B. J., Metcalf, B., Mackenzie, D., Russell, T., van den Berg, M., Finnin, K., Crowther, S., Aiken, J., Fleming, J., & Hinman, R. S. (2021). Physiotherapists and patients report positive experiences overall with telehealth during the COVID-19 pandemic: a mixed-methods study. Journal of Physiotherapy, 67(3), 201–209. https://doi.org/10.1016/j.jphys.2021.06.009

Cahya, D. A., Dewi, R. D. C., Tanggono, A., & Hidayat, R. (2025). Integrating Traditional Medicine into Mainstream Healthcare Systems: Challenges and Opportunities. Riwayat: Educational Journal of History and Humanities, 8(2), 1147–1158. https://doi.org/10.24815/jr.v8i2.45054

Eregata, G. T., Hailu, A., Memirie, S. T., & Norheim, O. F. (2019). Measuring progress towards universal health coverage: national and subnational analysis in Ethiopia. BMJ Global Health, 4(6), e001843. https://doi.org/10.1136/bmjgh-2019-001843

Farr II, J., Miller, L. E., & Block, J. E. (2013). Quality of Life in Patients with Knee Osteoarthritis: A Commentary on Nonsurgical and Surgical Treatments. The Open Orthopaedics Journal, 7(1), 619–623. https://doi.org/10.2174/1874325001307010619

Hunter, D. J., & Bierma-Zeinstra, S. (2019). Osteoarthritis. The Lancet, 393(10182), 1745–1759. https://doi.org/10.1016/S0140-6736(19)30417-9

Ilori, T., Ladipo, M. M., Ogunbode, A. M., & Obimakinde, A. M. (2016). Knee osteoarthritis and perceived social support amongst patients in a family medicine clinic. South African Family Practice, 58(6), 1–5. https://doi.org/10.4102/safp.v58i6.4388

Kementerian Kesehatan Republik Indonesia. (2018). Indonesia Basic Health Research (Riskesdas) 2018. National Institute of Health Research and Development, Ministry of Health of the Republic of Indonesia.

Khanum, H. (2021). Etiology and Risk Factors for

Developing Knee Osteoarthritis. Biomedical Journal of Scientific & Technical Research, 34(3). https://doi.org/10.26717/BJSTR.2021.34.005 567

Kiadaliri, A. A., Lamm, C. J., de Verdier, M. G., Engström, G., Turkiewicz, A., Lohmander, L. S., & Englund, M. (2016). Association of knee pain and different definitions of knee osteoarthritis with health-related quality of life: a population-based cohort study in southern Sweden. Health and Quality of Life Outcomes, 14(1), 121. https://doi.org/10.1186/s12955-016-0525-4

Kolasinski, S. L., Neogi, T., Hochberg, M. C., Oatis, C., Guyatt, G., Block, J., Callahan, L., Copenhaver, C., Dodge, C., Felson, D., Gellar, K., Harvey, W. F., Hawker, G.,

Herzig, E., Kwoh, C. K., Nelson, A. E., Samuels, J., Scanzello, C., White, D., … Reston, J. (2020). 2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee. Arthritis & Rheumatology, 72(2), 220–233. https://doi.org/10.1002/art.41142

Manzoor, R., Asim, H., Arshad, H. S., Faisal, B., & Sarfraz, K. (2016). Quality of life in Elderly Population with grade 1 knee osteoarthritis. Journal of Riphah College of Rehabilitation Sciences, 4(2).

Palazzo, C., Nguyen, C., Lefevre-Colau, M.-M., Rannou, F., & Poiraudeau, S. (2016). Risk factors and burden of osteoarthritis. Annals of Physical and Rehabilitation Medicine, 59(3), 134–138. https://doi.org/10.1016/j.rehab.2016.01.006

Peat, G., McCarney, R., & Croft, P. (2001). Knee pain and osteoarthritis in older adults: a review of community burden and current use of primary health care. Annals of the Rheumatic Diseases, 60(2), 91–97. https://doi.org/10.1136/ard.60.2.91

Pertiwi, G. H., & Sastrini, Y. E. (2025). Pengaruh Pemberian Edukasi Terhadap Peningkatan Pengetahuan Keluarga Tentang Aktivitas Fisik Untuk Lansia. Jurnal Ners, 9(3), 4694–4699. https://doi.org/10.31004/jn.v9i3.46838

Rodriguez-Hernandez, M., C.-B., A., A.-R., & R., Amián, J. G., & Martin-Valero, R. (2021). The role of social support in patients with osteoarthritis: a systematic review. Disability and Rehabilitation, 43(23), 3277–3285

Yuniarsih, S. M., Padmawati, R. S., Madyaningrum, E., Widhow, S. S., & Mahendradhata, Y. (2024). Integration of Traditional Medicine Services into Public Health Centers in Indonesia: A Qualitative Study. https://doi.org/10.21203/rs.3.rs-5291992/v1

Zhang, W., Nuki, G., Moskowitz, R. W., Abramson, S., Altman, R. D., Arden, N. K., Bierma-Zeinstra, S., Brandt, K. D., Croft, P., Doherty, M., Dougados, M., Hochberg, M., Hunter, D. J., Kwoh, K., Lohmander, L. S., & Tugwell, P. (2010). OARSI recommendations for the management of hip and knee osteoarthritis. Osteoarthritis and Cartilage, 18(4), 476–499. https://doi.org/10.1016/j.joca.2010.01.013

Sujimat, D. Agus. 2000. Penulisan karya ilmiah. Makalah disampaikan pada pelatihan penelitian bagi guru SLTP Negeri di Kabupaten Sidoarjo tanggal 19 Oktober 2000 (Tidak diterbitkan). MKKS SLTP Negeri Kabupaten Sidoarjo

Suparno. 2000. Langkah-langkah Penulisan Artikel Ilmiah dalam Saukah, Ali dan Waseso, M.G. 2000. Menulis Artikel untuk Jurnal Ilmiah. Malang: UM Press.

UNESA. 2000. Pedoman Penulisan Artikel Jurnal, Surabaya: Lembaga Penelitian Universitas Negeri Surabaya.