

## An integrative review on middle-aged men's andropause



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### ABSTRACT

This paper aims to explore how middle-aged men manage andropause. It draws on extensive research to provide essential information for developing a management program to support them. The study involved searching electronic databases with keywords like 'male,' 'andropause,' 'male andropause,' and 'mediation' to locate relevant research. From January 2002 to January 2022, 11 studies were selected after reviewing the complete texts of articles published in international academic journals. These studies comprised 8 on individual coping strategies and 3 on group coping strategies for andropause. The subjects included 6 men undergoing hormone therapy, 2 with hormone deficiency, 2 on antidepressants, and 1 with type 2 diabetes. The assessment tools in these studies primarily focused on hormones, hormone deficiency, and diabetes. The results suggest that coping strategies for andropause can significantly enhance nursing care, indicating that effective use of these strategies by nurses could improve nursing outcomes.

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### 1. Introduction

Male andropause is linked to age-related changes in testosterone levels. It is also referred to as testosterone deficiency, androgen deficiency, and late-onset hypogonadism (Handelsman and Liu, 2005; Folorunsho et al., 2024). This condition occurs in men aged 50 or older and is often connected with decreased testosterone production, commonly associated with hypogonadism. Both conditions lead to low testosterone levels and share similar symptoms (Heinemann et al., 2003; Guerra-Junior et al., 2012). Testosterone, a hormone produced by the testicles, plays multiple roles beyond enhancing sexual desire. It influences changes during puberty, supports mental and physical energy, maintains muscle mass, regulates the fight-or-flight response, and manages other crucial biological functions (Morales et al., 2007). Male andropause differs from female andropause in several ways, including that not all men experience it, and it does not completely halt reproductive capabilities. However, reduced hormone levels can lead to sexual complications as a side effect (EC, 2012). Male andropause can lead to various physical, sexual, and psychological issues

that often intensify with age. Key symptoms include a lack of energy, feelings of depression or sadness, reduced motivation, low self-confidence, difficulty concentrating, sleep disturbances, increased body fat, reduced muscle mass and strength, breast development in men (gynecomastia), lower bone density, erectile dysfunction, reduced sexual desire, smaller testicle size, loss of body hair, and facial flushing. The primary influence of male andropause is on testosterone levels, which are crucial for many body functions. Low testosterone levels also increase the risk of osteoporosis, leading to weaker and more fragile bones (Abootalebi et al., 2017; Wu et al., 2010).

It has been observed that andropause in men can sometimes be managed without medical intervention, provided it does not lead to significant life disruptions. Nonetheless, when symptoms of male andropause appear, many men find it challenging to discuss these issues with their doctor. Studies have shown that men often feel too embarrassed or afraid to talk about sexual health issues with their healthcare providers (Wong et al., 2010; Taavoni et al., 2009). Those experiencing symptoms of male andropause may face broader health problems, making it advisable to seek medical advice. Educational support and nursing interventions are also recommended to manage these symptoms effectively. For those suffering from depression linked to male andropause, considering antidepressant treatment, lifestyle adjustments, and hormone replacement therapy may be beneficial (Tkaczyszyn et al., 2013; Yazd Kasti et al., 2008).

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As men reach middle age, their levels of sex hormones, such as testosterone and dihydrotestosterone, significantly decrease. This reduction is linked to decreased exercise capacity, exacerbated symptoms of depression, reduced libido, and increased susceptibility to other diseases (Wong et al., 2010). Research into andropause began in Iran with a study by Taavoni et al. (2009). Since then, numerous studies have focused mainly on the important symptoms and complications of male andropause, enhancing our understanding of its impacts on health (Abootalebi et al., 2017; Handelsman and Liu, 2005; Wong et al., 2010; Taavoni et al., 2009; Yazd Kasti et al., 2008).

In examining research related to male andropause, it is essential to synthesize results from various studies to systematically organize the information gathered internationally. This involves securing and integrating reliable evidence to assess and reconcile differing findings in a scientific and objective manner. An integrated review, a method proposed by Whitemore and Knafelz (2005), expands on the traditional systematic review approach to achieve this goal.

In this context, the current study aims to review and confirm the research on andropause management methods for men conducted internationally over the past 20 years. The findings will be integrated and analyzed to develop evidence-based practical programs and to propose directions for future research.

## 2. Research method

### 2.1. Research design

This study is an integrated study intended to objectively articulate and specify the effectiveness of male andropause management conducted overseas.

### 2.2. Research procedures

The integrated study method is designed to thoroughly understand a topic by reviewing a diverse range of research papers, including both quantitative types like descriptive and empirical research, as well as qualitative research. This approach was outlined by Whitemore and Knafelz (2005). Using this method, the research supervisor, with a background in publishing in both domestic and international journals, plans to closely collaborate with co-researchers throughout the research process. This process involves selecting, evaluating, and analyzing the research papers. The method proceeds in five stages:

1. Problem identification stage: Here, researchers define the research question or problem. They choose the specific concepts, subjects, and health-related issues to focus on, which helps determine the type of literature to be analyzed and the framework for extracting data. For instance, in this

study, papers on interventions for male andropause are extensively reviewed.

2. Literature search stage: Researchers establish a systematic strategy for searching literature that fits the research problem identified earlier. This involves selecting keywords that will cover the broad concept of the study to avoid incomplete and biased searches. Various academic databases and manual searches of journals are used to gather all relevant literature.
3. Data evaluation stage: This stage involves assessing the initially found literature, taking into account different research methodologies to ensure a comprehensive review. The selection of literature is based on both methodological and theoretical considerations.
4. Data analysis stage: At this point, data are extracted from the selected literature and analyzed collectively. This integrated analysis helps in developing new, abstracted concepts from the data. The analysis process involves regular meetings where researchers discuss, identify relevant literature, extract data, and reach a consensus.
5. Presentation stage: Finally, the results of the integrated review are presented. This stage involves summarizing and discussing the findings in detail, showcasing the results of the analysis.

This structured approach allows for a thorough and systematic examination of the research topic, aiming to provide a deep understanding and well-supported conclusions (Whitemore and Knafelz, 2005).

### 2.3. Research question defining stage

The initial stage of this integrated study aims to clearly define its purpose by identifying the main issue it intends to address. The study focuses on male andropause, exploring key aspects such as the concept itself, the subjects involved, and the methods of intervention used. Through discussions within a research team, the study seeks to clarify these elements to set a specific research objective. The primary question guiding this research is: "What is the current state of nursing research on male andropause, both domestically and internationally?" The goal is to assess the present understanding and practices in this area to guide future studies and interventions. Additionally, the findings are expected to lay a scientific foundation and provide essential data to advance nursing practices related to male andropause, particularly in Korea, aiming to enhance future nursing interventions and practices in this field.

### 2.4. Data collection period and method

The second step of the integrated study involves a detailed data collection process that aligns with the research topic. This stage was carried out from December 1, 2022, to December 31, 2022. All

processes during this phase were meticulously documented to ensure the accuracy and transparency of the data collected. The search strategy was divided into domestic and international approaches:

1. Domestic search: The terms used included 'middle-aged men's andropause,' 'middle-aged men's andropause mediation,' and 'andropause education.' These terms were chosen to represent the subjects (middle-aged men experiencing andropause) and the intervention (andropause mediation) aspects of the study.
2. International search: This involved using controlled vocabulary from MEDLINE, such as MeSH (Medical Subject Headings) terms including 'andropause,' 'Male,' and 'intervention.' Additional searches were conducted in major databases like the Cochrane Library CENTRAL, PubMed, Embase, and CINAHL, which specializes in nursing. Keywords were selected from the study abstracts to guide the searches.

Selection criteria: The papers chosen had to meet specific criteria:

- They needed to be full-text articles published from the start of the database until December 2022.
- They had to be from academic journals or dissertations published in either Korean or English.
- Both experimental and non-experimental studies related to the mediation for men of andropause were included.

Exclusion criteria: Papers focused on psychotherapy with drug application were excluded, as were duplicate dissertations among the academic journal papers.

After searching through four major databases, the initial pool consisted of 112 articles. Through a thorough review process, including checks for relevance and redundancy, the researchers narrowed these down to 11 pertinent studies after excluding those that did not directly address male andropause mediation or were not experimental in nature.

This meticulous approach ensures the collection of relevant, high-quality data that directly supports the research objectives, providing a solid foundation for subsequent analysis and presentation stages (Fig. 1).

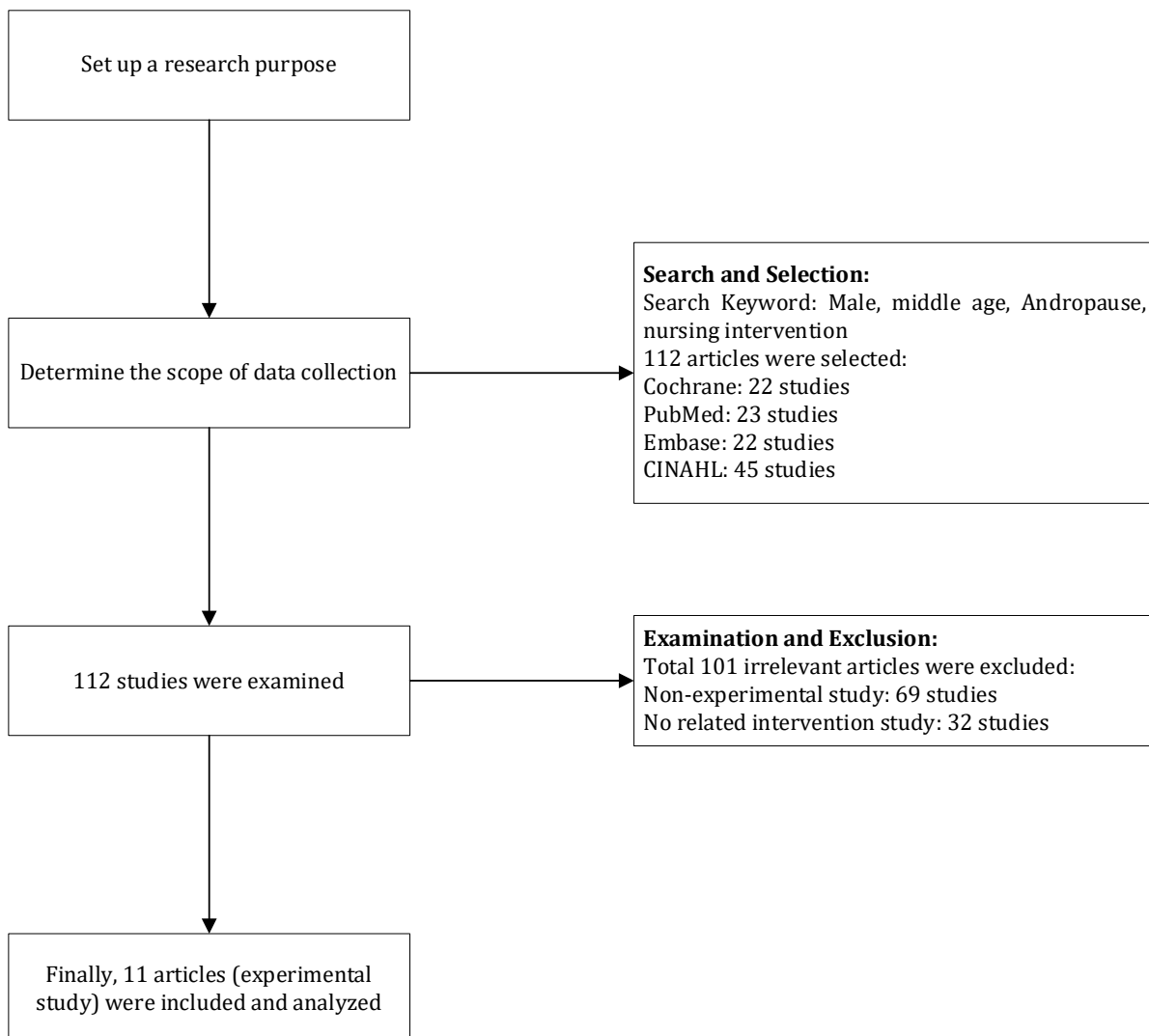


Fig. 1: Flowchart of included studies through database search

**2.5. Evaluation of data**

The third step involves evaluating data, which comes from the literature search. This evaluation integrates various research designs into a comprehensive study. It is important to use clear criteria to select and exclude studies. In this study, we used the Risk of Bias (RoB), which assesses the quality of randomized studies, and the Risk of Bias Assessment Tool for Non-Randomized Studies (RoBANS) to evaluate 13 mediation experimental studies for potential biases.

**2.6. Data analytical method**

The fourth step is the data analysis process, which involves interpreting the original data impartially and synthesizing its meaning. To ensure accuracy, researchers coded the data using Excel during this stage to capture all data comprehensively. They regularly met to compare and review the analyzed contents by field. Through these meetings, both online and offline, they coordinated opinions to achieve consensus on the data interpretation. Moreover, they documented the decision-making and progress of the study in detail from start to finish, enabling other researchers to clearly understand and agree on the analytical perspectives.

**2.7. Description of data**

The fifth step involves presenting data according to the nomadic attributes identified, based on [Whittemore and Knaf's \(2005\)](#) framework for thematic agreement among researchers. In this study, research on mediation for men experiencing andropause, both domestically and internationally,

was thoroughly reviewed. The characteristics of the identified variables were summarized. The summary table includes general characteristics, design, mediation methods, main effects of the variables, and the contents of the mediation discussed in the research papers.

**3. Research results**

**3.1. General characteristics of the papers subject to research**

The analysis of 11 international studies on male andropause mediation conducted from 2002 to 2022 revealed the following findings ([Table 1](#)). The studies were published over two decades, with no studies prior to 2002. Five studies were conducted between 2002 and 2012, and six from 2013 to 2022. The journal "Aging Male" published the highest number of studies (three), followed by two each in "Urologie," "Diabet Med," "Psychoneuroendocrinology," "Maturitas," "F S Rep," "Clin Interv Aging," and "Iran Red Crescent Med J." Regarding study designs, the unequal control group post-test design was most common, appearing in seven studies. Two studies used a single-group pre-post design, one used an equivalent control group post-test design, and one was categorized as a non-equivalent control pre-post design. Measurement tools in these studies frequently focused on hormone levels (six studies), andropause and aging in males (two studies), depression scales (two studies), and diabetes (one study). Across the 11 studies, the experimental groups totaled 3,466 participants, averaging 385.1 per study, while the control groups totaled 80 participants, averaging 44.0 per study ([Table 1](#)).

**Table 1:** Characteristics of included studies (N=11)

Variable	Category	n	%
Published year	2002-2012	5	45
	2013-2022	6	55
Published Journal	Aging male	3	26.8
	Urology	2	18.0
	Diabet Med	1	9.2
	Psychoneuroendocrinology	1	9.2
	Maturitas	1	9.2
Study design	F S Rep	1	9.2
	Clin Interv Aging	1	9.2
	Iran Red Crescent Med J	1	9.2
	Nonequivalent control group posttest only design	7	63.6
	one-group pretest-posttest design	2	18.0
	Equivalent control group posttest only design	1	9.2
	Nonequivalent control group pretest-posttest design	1	9.2
Subjects	Subjects undergoing hormone treatment	6	55.0
	androgen decline in the aging male	2	18.0
	major depressive disorder	2	18.0
Participants	Type 2 diabetes	1	9.0
	Experimental group	mean: 385.1	
	Control group	mean: 40.0	

**3.2. Analytical results of literature search**

[Table 2](#) presents an analysis of 11 international papers on male andropause mediation studies published between 2002 and 2022. This analysis

focused on papers that specifically addressed male andropause mediation. Among the 64 keywords identified in these studies, the most commonly occurring were 'Andropause,' 'Androgen,' 'Testosterone,' 'Aging,' and 'Health.'

**Table 2:** Keywords in search (N=11)

No.	Keywords	Frequency, n (%)
1	Andropause	19(29.6)
2	Androgen	16(25.0)
3	Testosterone	15(23.4)
4	Aging	9(14.0)
5	Health	5(8.0)

### 3.3. Content analysis of male andropause mediation studies

The male andropause-related individual mediation papers were 8 papers, and group mediation papers were simultaneously published in 3 papers. The subjects of the study were 6 men receiving hormone therapy, 2 men with hormone deficiency, 2 men taking antidepressants, and 1 man with type 2 diabetes. As for the male andropause mediation measurement tools, hormone measurement, hormone deficiency, and diabetes measurement were used (Table 3).

### 3.4. Results of methodological quality evaluation of male andropause mediation studies

In the methodological quality evaluation, 11 out of 11 papers were properly evaluated for the clearly stated purpose, compliance with the subject selection criteria, prospective data collection, follow-up period appropriate for the purpose of the study, homogeneity test of the experimental group, and control group, and the appropriate statistical analysis (Table 4).

## 4. Discussion

This study thoroughly reviewed research on problem-solving approaches for health issues related to male andropause. It aims to identify key factors necessary for effective intervention in male andropause and to discuss considerations for future research targeting this group.

The review of literature from the past 20 years shows that the first international studies on interventions for male andropause were published in 2002. By 2022, only 11 such studies had been published. This modest number of studies, despite ongoing research since 2022, highlights the ongoing need for attention to male andropause. Therefore, it is crucial to continue research on the prevention, treatment, and rehabilitation of male andropause within the healthcare field.

In this study, the primary variables considered for men experiencing andropause included Andropause, Androgen, Testosterone, Aging, and Health. For research focusing on women, the identified variables were Andropause, Depression, Quality of Life, Andropause Symptoms, Body Composition, and Blood Analysis. Park et al. (2007) found that middle-aged individuals are particularly prone to develop symptoms of andropause alongside physical aging due to hormonal changes. Therefore, it is essential to identify and analyze the factors

influencing andropause management in middle-aged men, including the impact of hormones and andropause symptoms.

This review found that among the 11 international studies on interventions for male andropause, the majority were quasi-experimental. Specifically, 7 studies used post-hoc designs with non-equivalent control groups, 2 studies employed single-group pre-post designs, and 1 study utilized a post-hoc design with an equivalent control group. Additionally, one study used a non-equivalent control pre-post design. Experimental research, which allows for the determination of causal relationships between variables, has been predominantly used in this field. Therefore, to further understand the management of menopausal symptoms, future studies should employ rigorous and repeated research methods to effectively assess symptom management in middle-aged men.

This study focused on 6 males undergoing hormone therapy, 2 males with hormone deficiency, 2 males on antidepressants, and 1 male with type 2 diabetes. According to Oh and Oh (2011), factors influencing andropause in middle-aged men include physical, mental, and social changes due to hormonal, physiological, and chemical shifts. Park et al. (2007) noted that middle age brings about aging and andropause symptoms linked to hormonal changes, leading to decreased physical functions and increased psychological stress, anxiety, and depression.

A significant portion of men in Korea, approximately 64.6%, experience andropause symptoms. Additionally, the Massachusetts Male Aging Study (MMAS) in the United States estimates 481,000 new cases of andropause syndrome annually, underscoring its growing significance (O'Donnell et al., 2004). Given these findings, it is essential to provide individualized nursing care tailored to improve the quality of life for men experiencing andropause and related health issues, including those undergoing hormone therapy, those with hormone deficiencies, those taking antidepressants, and those with type 2 diabetes.

In the 11 studies reviewed, tools for measuring aspects of male andropause were commonly used. These included hormone measurement tools in 6 studies, male aging and androgen measurement in 2 studies, depression scales in 2 studies, and diabetes level measurement in 1 study. From a biomedical viewpoint, andropause is seen as a condition resulting from changes in endocrine hormones. It is considered a syndrome caused by hormone deficiency and is typically treated by healthcare professionals (NHIP, 2021).

**Table 3:** Summary of the literature

Author	Year	Number of samples	Study design	Intervention	Outcome variable	Results
Delhez et al.	2003	153	One-group pretest-posttest design	This study examined the psychological symptomatology of men diagnosed with andropause	Testosterone (T) and depressed mood, anxiety and	The results showed that levels of free T decreased with age, whereas FSH and LH increased
Yoshida et al.	2006	83	Nonequivalent control group posttest-only design	Does the aging males' symptoms scale assess major depressive disorder	MDD, beck depression inventory, AMS	Almost half the patients had MDD. The total AMS score, the scores on the AMS psychological, somatic and sexual subscales, and the scores for all except three questionnaire symptoms were higher in patients with MDD. There were strong correlations between the AMS scale and the Beck Depression Inventory
O'Brien et al.	2005	60	Nonequivalent control group posttest-only design	Erectile dysfunction and andropause symptoms in	Androgen deficiency in the aging male and sexual health inventory for men (SHIM) questionnaires	Of the 302 infertile men screened, 38% reported significant andropause symptoms and 28% had abnormal SHIM scores. Of the subgroup of infertile men with nonobstructive azoospermia, 25% reported andropause symptoms and 27% had an abnormal SHIM score. In the fertile group 21% reported andropause symptoms and only 11% had an abnormal SHIM score. The prevalence of erectile dysfunction in infertile men was significantly higher than in the fertile controls (p0.007)
Goel et al.	2009	157	Nonequivalent control group posttest-only design	Androgen decline in the aging male (ADAM) in a group of Indian men	ADAM questionnaire, and their serum levels of free and total testosterone were measured	Symptomatic andropause was found in 106 men (67.5%) on the basis of their responses to the questionnaire, of whom 41 (38.7%) had low serum free testosterone levels and 32 (30.2%) had low serum levels of total testosterone. Fifty-one men were asymptomatic according to the questionnaire and in this group, 11 (21.6%) had low serum free testosterone levels and 6 (11.8%) of these had low total testosterone levels. The frequency of andropause was 33.1% on the basis of low serum free testosterone levels and it was 26.1% when both symptoms and low serum free testosterone levels were taken into account
Fukui et al.	2012	267	Nonequivalent control group posttest-only design	Pittsburgh sleep quality index, self-rating	Andropausal symptoms among men with type 2 diabetes	Andropausal symptom scores such as the Pittsburgh Sleep Quality Index, the Self-Rating Depression Scale, the International Index of Erectile Function and the International Prostate Symptom Score were 4.2 2.6 vs. 5.0 3.3, P < 0.01
Chen et al.	2013	176	Nonequivalent control group posttest-only design	The correlation between emotional distress and aging males' symptoms at a psychiatric outpatient clinic	Completed self-reported measures assessing symptoms of aging, depression, and anxiety	Age was correlated with less anxiety and more sexual symptoms. Anxiety and depression were associated with more severe symptoms of aging, and depression was associated with more sexual symptoms than was anxiety. Impaired sexual potency was the only sexual symptom not significantly associated with depression and anxiety. Depression was associated with an interspousal age gap of \$6 years. The point prevalence of erectile dysfunction was 28.4%, and age and affective disturbance were associated with the risk of erectile dysfunction
Satkunasivam et al.	2014	1750	Equivalent control group posttest only design	Androgen deficiency in the aging male (ADAM)	Serum hormone	The prevalence of ED and a positive response to the ADAM questionnaire were 30.5% and 45.2%, respectively, in this population (mean age, 36 years). Low serum T (total T < 10 nmol/L) was found in 29.4%. Neither T nor bioavailable T was significantly associated with the symptoms of ED or TDS on multivariable regression analysis
Sofimajidpour et al.	2015	80	Nonequivalent control group posttest-only design	The effect of testosterone on men with andropause	Testosterone	The mean age of patients was 56.57 ± 3.21 years. A total of 31 patients (39%) were smokers, among them 30% smoked daily, 2.5% weekly and 6% smoked for fun. The mean testosterone level before treatment was 240.6 ± 125.4 and at 1, 3 and 6 months after treatment the level was raised, so that at the end of the sixth months it was 578.7 ± 141.7. The level of increase was statistically significant (P = 0.0001)
Abootalebi et al.	2017	402	One-group pretest-posttest design	Assessment of the validity and reliability of a questionnaire on knowledge and attitude of general practitioners about andropause	Andropause	Content and face validity of the questionnaire was confirmed by experts. The reliability was confirmed by Cronbach's alpha of (0).895 for the part on knowledge and (0).839 for the part on attitude
Hirokawa et al.	2020	418	Nonequivalent control group	Investigate the association between andropause symptoms and sickness absence	Testosterone level	During the follow-up period, 31 of 35 participants who took sickness absences had physical illnesses. A higher andropause symptom score was associated

Abootalebi et al.	2020	80	posttest-only design	Effect of education about andropause health on level of the knowledge	Attitude about andropause	with an increased risk of sickness absence
			Nonequivalent control group pretest-posttest design			There was no significant difference between the intervention and control groups before the intervention. There was a significant difference in knowledge and attitude scores in each group immediately and 1month after the intervention. The mean score of knowledge in the intervention group increased from 2.92 ± 1.68 before to 16.22 ± 1.34 after the intervention, and the attitude score increased from 14.9 ± 1.08 to 28.52 ± 1.44. Comparison of the two groups and repeated score analysis showed that there was a significant difference between the two groups over the time (p<.001)

**Table 4:** Assessment of the risk of bias

Reference	Clear purpose statement	Target selection criteria	Prospective data collection	Draw a conclusion that be right to research purpose	Reasonable evaluation about result	Appropriate follow-up period	Less than 5% of the eliminated	Sample size calculation standard	Appropriate control group	Simultaneous administration of the test and control groups	Homogeneous test between groups	Appropriate statistical analyzes
Delhez et al. (2003)	2	2	2	2	2	2	2	2	2	1	2	2
Yoshida et al. (2006)	2	2	2	2	2	2	1	0	1	1	2	2
O'Brien et al. (2005)	2	2	2	2	2	2	1	2	2	1	2	2
Goel et al. (2009)	2	2	2	2	2	2	2	2	2	1	2	2
Fukui et al. (2012)	2	2	2	2	2	2	1	0	0	0	2	2
Chen et al. (2013)	2	2	2	2	2	2	2	0	1	1	2	2
Satkunasivam et al. (2014)	2	2	2	2	2	2	1	2	2	2	2	2
Sofimajidpour et al. (2015)	2	2	2	2	2	2	2	2	2	2	2	2
Maliheh Abootalebi(2017)	2	2	2	2	2	2	2	0	1	1	2	2
Hirokawa et al. (2020)	2	2	2	2	2	2	2	0	1	1	2	2
Maliheh Abootalebi(2020)	2	2	2	2	2	2	2	0	1	2	2	2

This research indicated that androgen therapy enhances well-being and sexual desire in men experiencing andropause, significantly decreases bone resorption metabolites, and effectively improves bone density, body fat, and muscle composition. Transdermal testosterone supplementation has been found to enhance quality of life by improving physical and mental functions, including sexual and metabolic functions. Furthermore, administering testosterone to men with low testosterone levels for six months led to improvements in fatigue, insomnia, muscle strength, cognitive abilities, and depression, as well as enhanced sexual symptoms and life satisfaction (Park, 2019). Studies also confirmed the efficacy and safety of oral testosterone, noting minimal side effects and significant improvement in symptoms of PADAM (partial androgen deficiency in aging male) among Koreans (Park, 2019).

Based on these findings, continuous research on andropause symptoms and various related variables in middle-aged men is essential for alleviating menopausal symptoms in this demographic. Future research on andropause mediation should adopt a comprehensive and multidimensional approach, focusing on more scientific and evidence-based studies to address the need for reliable information in nursing care practices.

## 5. Conclusion and recommendations

Various effective strategies for managing andropause in middle-aged men have been proposed in different fields, and some nursing practices have begun implementing these strategies as part of andropause management therapy. However, the specifics of these practices are not well-documented. This study used an integrated literature review method to objectively and systematically analyze 11 international nursing research papers on male andropause. The aim was to develop an intervention program for men experiencing andropause, identifying essential nursing interventions for managing this condition. The intervention program identified includes hormone therapy and the management of depression and diabetes specifically tailored for middle-aged men. The findings suggest that regular, integrated care programs provided in various community settings, along with preventive nursing interventions, can play a crucial role in supporting the health of middle-aged men in clinical or community settings. Additionally, given that symptoms and conditions vary among individuals, ongoing research on andropause in middle-aged men is necessary.

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## Compliance with ethical standards

## Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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