REVIEW

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Assessment and Detection of male Reproductive Outcome (ANDRO) model as a concept for improving the contribution of general practitioners in Indonesia for male infertility management

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ABSTRACT

Specialist distribution in Indonesia was not equally between urban and rural areas. In this condition, the role of general practitioners is critical as a front guard for handling patients with infertility problems, especially male infertility, before making a referral to an andrologist. There has been no guidance for general practitioners in Indonesia to contribute to managing male infertility until now. We identify male infertility problems and the level of competence of general practitioners in providing interventions based on "Standar Kompetensi Dokter Indonesia (SKDI)" or Standard of Competencies Indonesian Doctors. Furthermore, a guideline, namely the Assessment and Detection of male Reproductive Outcome (ANDRO) model, is made by conducting a literature review based on male infertility problems and the level of competency that have been identified before. ANDRO model is consists of major and minor aspects of male infertility make a star form. The significant elements including the risk of a reproductive problem, sexual dysfunction, abnormal sperm, presence of testicular mass, and small testicular volume. While the minor aspects including physical activity, body mass index management, metabolic problem management, lifestyle modification, and stress management. ANDRO model offers the opportunity for general practitioners to contribute to a couple who wants to have a baby by treating or improving factors related to male infertility.

Keywords: Andrologist, General Practitioners, Male Infertility, Standard of Competencies.
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INTRODUCTION

Infertility is defined as a disease condition that causes couples not to get pregnant after 12 months by having regular sexual intercourse 2-3 times a week without contraception. As a disease, infertility problems must be considered to get treatment by medical doctors. Male and female factors cause the problem of infertility. Both of them give an equal contribution as its factors.[1] World Health Organization (WHO) said that one of four couples in developing countries needs to be attended to infertility problems. An estimated about 48.5 million couples in the world have this problem. The study by WHO was found the burden of infertility was still high since 1990. Indonesia was identified about 2-2.9% of the prevalence of primary infertility among women who try to conceive 20-44 years old.1 Estimation of the prevalence of infertility in the population of reproductive age vary, ranging from 10% to 15%.[1]

People assumed that management of infertility problems was a competency of specialist doctors. Couples with infertility problems usually visit a specialist, especially a gynecologist, to solve their problem.[2] This also happens in Indonesia with the unequal distribution of specialist doctors between urban and rural areas.[3] In Indonesia, there is an andrologist as a specialist doctor who has competencies for male infertility problems but is still limited. In this condition, the role of general practitioners is critical as a front guard for handling patients with male infertility problems. Male infertility patients who come to a general practitioner can be referred to an andrologist if there is any access.

The competencies of medical doctors, especially general practitioners in Indonesia, are regulated by the government in "Standar Kompetensi Dokter Indonesia (SKDI)" or Standard of Competencies Indonesian Doctors. General Practitioners have competencies at level 3A for male infertility problems. The problem at level 3A is a non-emergency condition. Graduate doctors are able to make clinical diagnoses and provide preliminary therapy in non-emergency cases. At this level, graduate doctors should determine the most appropriate referral for patients and follow up after returning from referral.[4]

In daily practice, the general practitioners must know what to do during a consultation with male infertility patients. There is no guideline for general practitioners in Indonesia to contribute to managing male infertility until now. The involvement of general practitioners is needed in treating male infertility

patients at a basic competency level. This paper aims to provide guidance to general practitioners, to be used as a reference in managing infertility problems at the primary level.

METHODS

At present, Indonesian Medical Council has announced the competencies of general practitioners in Indonesia by SKDI after being a medical doctor from medical education.[4] We identify male infertility problems and the level of competence of general practitioners in providing interventions based on SKDI. The issues related to male infertility and the level of competence of general practitioners can be read in Table 1. A guideline is made by conducting a literature review based on male infertility problems and the level of competency that have been identified before according to relevant literature enrolled.

RESULTS

The guideline, namely the Assessment and Detection of male Reproductive Outcome (ANDRO) model, consists of 5 major aspects and 5 minor aspects of male infertility, which form a star pattern (Figure 1). The 5 major aspects are fundamental elements in the level of competence of general practitioners to make referrals to specialist doctors. Meanwhile, the 5 minor aspects in the ANDRO model are the basic level intervention for male infertility patients that general practitioners can do to improve sperm quality and quantity. The 5 significant aspects fill at the point of the star spike and 5 minor aspects fill at the point inside the star. The 5 major aspects consist of 1) Risk of a reproductive problem; 2) Sexual dysfunction; 3) Abnormal sperm analysis; 4) Present testicular mass; and 5) Small testicular volume.

The 5 major aspects in the ANDRO model include competence 2 and 3A based on SKDI (Table 1). The risk of reproductive problems with the level 2 competencies is micropenis, hypospadias, epispadias, undescensus testis, varicocele, retractile testicle, hydrocele, spermatocele. Besides that, the risk of reproductive problems with competencies 3A is: epididymitis, orchitis, urethritis non GO with complication epididymitis, urethritis GO with complication epididymitis, male infertility, erectile dysfunction, ejaculation dysfunction, hyperthyroid/hypothyroid.

Table 1. List of male reproductive problems and level of competency.

List of Problem/Disease	Level of Competency
Micropenis	2
Hypospadias	2
Epispadias	2
Undescensus testis	2
Varicocele	2
Retractile testicle	2
Hydrocele	2
Spermatocele	2
Epididymitis	3 A
Testicular torsion	3 B
Prostatitis	3 B
Orchitis	3 A
Testicular teratoma	1
Urethral stricture	2
Gonorrhea	4
Urethritis non-GO non-complication	4
Urethritis non-GO with complication epididymitis	3 A
Urethritis GO non-complication	4
Urethritis GO with complication epididymitis	3 A
Male infertility	3 A
Erectile dysfunction	3 A
Ejaculation dysfunction	3 A
Gigantomastia/gynecomastia	2
Diabetes mellitus	4
Hyperthyroid/hypothyroid	3 A
Hypogonadism	2
Prolactinemia	1
Deficiency of micronutrient	4
Malnutrition of energy/protein	4
Dyslipidemia	4
Obesity	4
Metabolic syndrome	4

GO: Gonorrhea; Definition of level competency: 1) Know and explain; 2) Diagnose and refer; 3A) Diagnose, early management and refer for non-emergency cases and 3B for emergency cases; 4) Diagnose and management totally[4]

Sexual dysfunction in the major aspect of the ANDRO model includes micropenis and varicocele (level of competence 2), erectile dysfunction, ejaculation dysfunction, hyperthyroid/hypothyroid (level of competence 3A). Sexual dysfunction related to the level of competence 1 is prolactinemia (Figure 1).

Abnormal sperm analysis related to the level 2 competence is micropenis undescensus testis, varicocele, hydrocele, spermatocele. Level of competence 3A is: epididymitis, orchitis, urethritis non-GO with complication epididymitis, urethritis GO with complication epididymitis, ejaculation dysfunction, hyperthyroid/hypothyroid. Abnormal sperm analysis problem related to the level of competence 1 is prolactinemia (Figure 1).

The presence of testicular mass related to the level of competence 1 is a testicular teratoma. Small testicular volume, using Prader orchidometer, associated with the level of competence 2 is hypogonadism. Besides that, the 5 minor aspects consist of interventions that can be done by general practitioners in treating male infertility patients at the primary level: 1) Physical activity; 2) Body mass

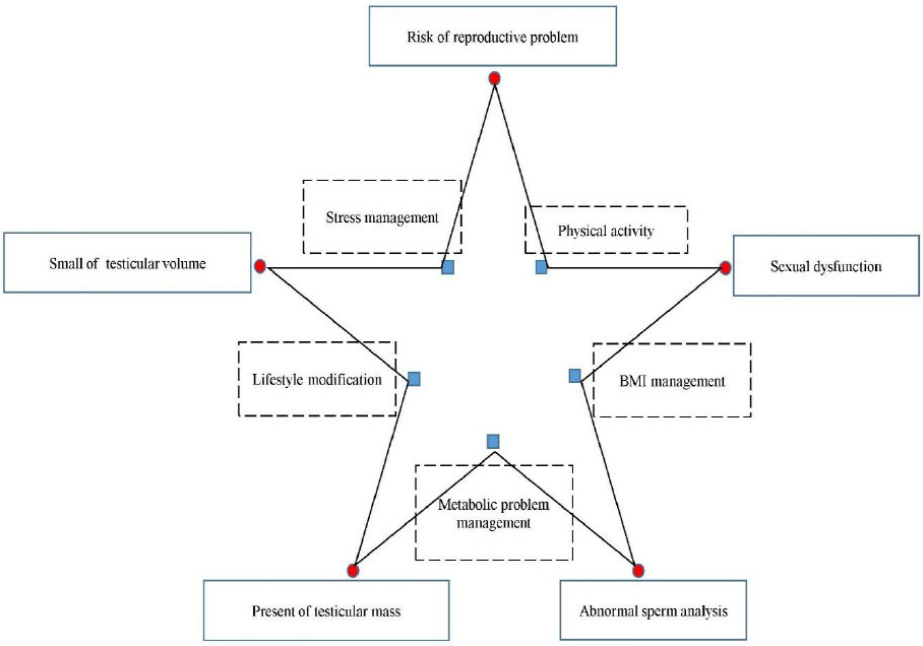

Figure 1. The ANDRO model consists of 5 major aspects, which are indicated by a round point in red and 5 minor aspects, which are characterized by a blue rectangle forming a star pattern.

index management; 3) Metabolic problem management; 4) Lifestyle modification; and 5) Stress management (Figure 1).

There is obesity in male infertility cases, which is classified at the level of competencies 4 based on SKDI. General practitioners can fully manage that through physical activity. General practitioners can also manage some male problems by BMI management such as deficiency of micronutrients, malnutrition of energy/protein, and obesity. General practitioners can do metabolic problem management in the cases of dyslipidemia, obesity, and metabolic syndrome at the level of competencies 4. General practitioners can manage dyslipidemia, obesity, and metabolic syndrome by suggesting lifestyle modifications to the patients.

DISCUSSION

General Practitioners in Indonesia are expected to increase their contribution to managing male infertility using the ANDRO model. General practitioners can be involved in the management of male infertility for 5 majors in the ANDRO model (Figure 1) by history taking, physical examination, and laboratory examination such as sperm analysis, reproductive hormones, and followed with referring to the Specialist as stated in Table 1 (level of competencies 1 and 2). They can early provide interventions according to their level of competence 3A (Table 1) and then a specialist referral. General practitioners can fully manage the male infertility patients for the 5 minors in the ANDRO model (Figure 1).

There are no specific guidelines for the handling of male infertility patients for general practitioners in Indonesia. SKDI is the only regulation that is used as a guideline in Indonesia. It was different from the USA, with guidelines from the American Society for Family Medicine for general practitioners/physicians. Male infertility management begins with anamnesis or history taking, followed by a general physical examination and a thorough andrological examination of the testes and penis and is completed with sperm analysis.[5,6]

The Risk of Reproductive Problem

The risk of a reproductive problem is a major aspect in the advanced management of male infertility in the ANDRO model. This is the one outer point in the star pattern of the ANDRO model. Many conditions related to the risk of reproductive problems are in the level competency of 1, 2, and 3 based on SKDI (Table 1). General practitioners only know and can explain those problems to the patients and making a referral to an andrologist for further management.[4]

The risk of reproductive problems can be found by assessing the history of small testis/penis, hypospadias or epispadias, swollen testes, unequal size or a number of testicles, testicular trauma, decreasing of testicular volume due to the impact of parotitis with orchitis, and testicular pain. History of stricture will rise from a patient with a history of severe urethritis or surgery at the urethra. History of metabolic disease, kidney disease, tuberculosis, medication such as chemotherapy, corticosteroids, and anti-malaria also must be assessed. The next step is finding any problems during physical examination, especially andrological assessment, include testicle (number, size, consistency, pain); epididymis (swollen/pain, mass), vas deferens (swollen, mass), penis (size, mass, hypospadias or epispadias, curvature) and varicocele if any. We also can find hernia scrotal, undescent of the testis, lichenification of scrotal/dermatitis of scrotal.[6-8]

In the major aspect of the ANDRO model, several male reproductive problems related to the risk of reproductive issues with the level of competencies 2 are micropenis, hypospadias, epispadias, and undescensus testis varicocele, retractile testicle, hydrocele, and spermatocele. At the level of competencies 3A, some problems can be diagnosed and early managed by the general practitioners and followed by making a referral to a specialist, such as epididymitis, orchitis, urethritis non-GO with complication epididymitis, urethritis GO with complication epididymitis, male infertility, erectile dysfunction, ejaculation dysfunction, hyperthyroid/hypothyroid.[4]

Sexual dysfunction

Sexual dysfunction is one of the major aspects of the ANDRO model that can be investigated by history taking. In SKDI competency, sexual dysfunction problems, including erectile dysfunction, ejaculation dysfunction, and hyperthyroid/hypothyroid, are classified into level 3A. It means the general practitioners

have competency for diagnose and early management but still have to refer to specialist doctors, especially andrologists.[4] Several factors can interfere between the diagnosis of sexual and erectile dysfunction with metabolic syndrome because the two conditions are linked to each other.[9]

Many problems can be classified into level 2 of competencies from the physical or andrological examination, including micropenis and varicocele.[4] Besides that, there is prolactinemia as one of sexual dysfunction related to the level 1 competencies. Prolactinemia is a hormonal problem related to the high level of prolactin. It might be found in rare conditions in the population. The patients usually come to the doctor with a history of enlargement of the breast or related with gynecomastia which levels 2 in SKDI.[4,8]

Abnormal sperm analysis

Sperm abnormalities as one of the main factors causing male infertility are part of the major aspects of the ANDRO model. In competencies 2 of SKDI, there are some male reproductive problems related to abnormal sperm analysis, such as micropenis, undescensus testis, varicocele, hydrocele, and spermatocele. At this level, the general practitioners should make a diagnosis and referring the patients to the Specialist.[4] There are epididymitis, orchitis, urethritis non GO with complication epididymitis, urethritis GO with complication epididymitis, ejaculation dysfunction, and hyperthyroid/hypothyroid at the level of competencies 3A. The general practitioner can diagnose, provide initial management and make a referral to a specialist.[4]

Urethritis, epididymitis, and prostatitis are some of the urogenital problems caused by chlamydial infection. The chlamydial infection causes the formation of reactive oxygen species (ROS), which can induce the apoptosis of sperm cells.[10] One of the causes of urethritis is Neisseria gonorrhea infection. Several studies have examined the impact of various bacterial infections on sperm quality and male infertility. In some cases of *Neisseria gonorrhea*, an infection that is not appropriately treated will result in obstructive azoospermia.[11] Abnormal sperm analysis problem classified in the level of competencies 1 is prolactinemia. Increased serum prolactin levels will harm the process of spermatogenesis through inhibition of gonadotropin secretion from the anterior pituitary.[12]

The presence of testicular mass

The next major aspect of the ANDRO model is the presence of a testicular mass that can be found by assessing the history and andrological examination. The doctor will ask the patient if there is a history of testicular mass with or without pain. The physical examination is needed to prove the story from the patient by the presence of mass at the testis and knows it was tenderness or not. Testicular teratoma is classified into level 1 of competency-related infertility.[4,13]

Small of testicular volume

Adult male testis typically weighs about 20 grams with an average volume (TV) of 18.6 ± 4.8 cm^3. The dimension of the normal testis ranges from 3.6 to 5.5 cm in length and from 2.1 to 3.5 cm in width. Reduced testicular volume <12 cm^3 is associated with decreased testicular function.[14] Physical examination using a Prader orchidometer was performed to evaluate the testicular volume. The more accurate result can be obtained from the testicular ultrasound examination.[15,16]

Several studies have explored the relationship between sperm parameters or endocrine function (testosterone and gonadotropin serum concentrations) with testicular volume. Hypogonadism or small testis also can be found by andrological examination and it takes place also as a significant aspect in the ANDRO model. The small testis is related to the severe disorder of spermatogenesis and hormonal abnormality. It's clear if the appearance of testicular size is small identically with male infertility in severe conditions.[14] The level of competence in the treatment of hypogonadism is level 2 based on SKDI. Infertile male patients with hypogonadism need to be referred to a specialist, especially an andrologist.[4]

Based on research, small testes or hypogonadism are associated with chromosomal abnormalities such as Klinefelter syndrome, Y chromosome microdeletion/ Azoospermia Factors (AZF) region microdeletion, and fibrotization due to orchitis related to testicular failure or untreatable condition.[8,17,18]

On the other hand, the ANDRO model offers the opportunity for general practitioners to contribute to a couple who wants to have a baby by treating or improving factors related to male infertility. The general practitioners still suggest or collaborate with specialists to support efficacy during treatment for improving sperm parameters. Not only make a diagnosis or referral but the general practitioners should also be involved in managing the patient as long as related to the level of competency. Based on SKDI, the general practitioners can address the patients completely at level 4 of competency. Out of level 4, it must be referred to the male infertility specialist. There are 5 minor aspects in the ANDRO model that can be used as a guideline for general practitioners in managing patients with male infertility at a basic level. The 5 minor aspects of the ANDRO model consist of physical activity, body mass index management, metabolic problem management, lifestyle modification, and stress management.

Physical activity

Physical activity has a positive effect on various body functions, including the reproductive system.[19] Based on the SKDI, some problems are classified in the level of competencies 4 and can be fully managed by the general practitioners, such as obesity, dyslipidemia, and metabolic syndrome. A previous study stated that men with high total and central adiposity levels would negatively affect sperm quality.[20] Recreational physical activity that takes moderate to hard physical effort improves sperm parameters in infertile men with poor sperm quality.[21]

Based on the research, many final-year medical students are unaware of the physical activity recommendations, and 80% stated that they had not received training about lifestyle medicine.[19] It is also a problem in the medical education curriculum in Indonesia. The solution to this problem is to add topics related to physical activity as part of the disease management process into the medical

education curriculum and include it in SKDI as a level of competence.

Management of Body Mass Index (BMI) and Metabolic Problem

Obesity is a non-communicable disease with a high prevalence worldwide and is commonly associated with male infertility. Several theories suggest that obesity affects spermatogenesis, thus affecting male fertility potential. Obesity with a Body Mass Index (BMI) ≥ 30 kg/m^2 can cause the inflammatory process of chronic epididymitis related to sperm abnormality.[22] Metabolic comorbidities such as obesity, metabolic syndrome, and type-2 diabetes mellitus usually relate to hypogonadism.[23] An increase in visceral adipose tissue that initiates the development of metabolic disorders is thought to be the cause of decreased testosterone levels in men.[24]

In addition, a previous study showed an association between low BMI and semen quality, suggesting that low BMI may have a harmful effect on male fertility.[25] Abnormal body mass index is closely related to metabolic syndrome. A metabolic syndrome is a group of conditions that have negative impacts on health. Its prevalence increases along with the decreasing fertility potential rate.[26] General practitioners have full authority in managing patients with obesity and metabolic syndrome, so these do not continue to develop hypogonadism conditions.[4]

Lifestyle modification

Smoking, alcohol consumption, and obesity are risk factors associated with lifestyles that potentially affect sperm quality.[27] General practitioners are competent to provide management therapy in lifestyle modifications to male infertility patients with BMI and metabolic syndrome problems based on the SKDI competency level (Level 4).[4] General practitioners can suggest the patients with male infertility do routine exercise as one form of lifestyle modification. A previous study stated that exercise could increase the antioxidants and improve the semen parameters.[28]

In addition, lifestyle is also an essential factor related to relationships between humans, especially the sexual relationship lifestyle. These factors contributed to the spreading and development of Sexually Transmitted Diseases (STDs).[29] STDs such as gonorrhea (GO), urethritis non-GO non-complication, and urethritis GO non-complication classified in competencies 4 based on SKDI. General practitioners can fully manage these problems by medication and suggesting lifestyle modification.[4]

Stress management

Infertile patients are vulnerable to mental problems. Scientific evidence suggests that psychological stress can affect spermatogenesis due to decreasing testosterone secretion. Changes in hormone and sperm parameters can occur due to psychological stress. Anxiety and depression are the most common psychological disorders experienced by infertility patients.[30-32] Management of anxiety and depression in infertile patients needs to be considered to reduce the adverse effects that may be caused and are expected to help increase the success rate of infertility case management.[33] General practitioners in Indonesia can detect early anxiety and mild depression of patients as well as give any suggestions to avoid the increasing stress condition. To reduce the stress condition, general practitioners can provide non-medication interventions such as exercise therapy. Physical activity can reduce symptoms of mental health conditions and the risk of physical health complications. Promoting physical activity by the general practitioners can be an intervention for preventing anxiety disorders.[34]

Sleep disorders are closely related to various medical, psychological, and social conditions.[35]

One of the most common sleep disorders is insomnia and is often associated with various psychological problems.[36] A previous study showed that men with shorter sleep durations have lower sperm counts and survival rates than men with longer sleep durations.[37] Based on the SKDI, insomnia is classified at the level of competencies 4, so general practitioners can fully manage this insomnia that has a close relation to psychological stress by stress management intervention.[4]

CONCLUSION

ANDRO model can be used as a guideline for general practitioners in Indonesia to increase their contribution to male infertility management, especially in primary healthcare services. The role of general practitioners in the 5 majors of the ANDRO model can be done by history taking, physical examination, and laboratory examination such as sperm analysis, reproductive hormones, and followed with making a referral to the Specialist. General practitioners can also provide initial interventions according to their level of competence 3A and followed by referral to a specialist. General practitioners can fully manage the male infertility patients for the 5 minors in the ANDRO model.

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CONFLICT OF INTEREST

The author has no conflicts of interest to declare.

ETHICAL CONSIDERATION

This literature review follows the COPE and ICMJE protocol of publication ethics prior to the study being conducted.

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AUTHOR CONTRIBUTION

DMR contributed to the design and implementation of the research, analysis of the results, and writing the manuscript.

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