<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>SUBJECT AREA AND CATEGORY</th>
<th>PUBLISHER</th>
<th>H-INDEX</th>
</tr>
</thead>
</table>

**SCOPE**

Information not available.

Join the conversation about this journal.
Editorial Board

Editor-in-Chief

Dr. Gaurav Kant Saraogi
Sri Auribindeo Institute of Pharmacy, Indore-Ujjain State Highway, Indore, Madhya Pradesh, India
Email: editor@ijaponline.org, gauravksaraogi13@gmail.com

Associate Editors

Dr. Genta Ida
Department of Drug Sciences, University of Pavia, Italy
Email: ida.genta@unipv.it

Assistant Editors

Dr. Aweesh Kumar Yadav
Department of Pharmacognosy, Bhagwadeva Tirth Pharmacy College, Sagar, MP, India
Email: aweeshyadav@gmail.com

Dr. Arvind Guilde
Research & Development, Centre for Interdisciplinary Research, D. Y. Patil University, Kolhapur, Maharashtra, India
Email: arvind.guilde@gmail.com

Editorial Members

Dr. Kaitkar P. Patkar
Scientist D, Government of India, DST-R. M, Science & Technology, New Delhi, India

Dr. Tariq M. Nama
Waters Pacific Pte Ltd, Singapore

Dr. Carlotta Marisocol
Istituto di Chimica e Tecnologie del Farmaco, Sapienza Universita di Roma, Roma, Italy

Dr. Manoj Nahar
Sun Pharmaceutical Industries Limited, Vadodara, Gujarat, India

Dr. Tarek Abdelnaby Ahmed
Department of Pharmaceutics and Industrial Pharmacy, Faculty of Pharmacy, KAU, Jeddah, KSA

Dr. Elizabeth Faminga
Faculty of Pharmaceutical Sciences, University of Sao Paulo, Brazil

Dr. Surya Prakasharao Kovan
Western University of Health Sciences, Pomona, California, USA

Dr. N. Kanagathara
Savesha School of Engineering, Saveetha University, Chennai, India

Dr. Mohammed Elmowafy Gomaa Aburala
Department of Pharmaceutics, College of Pharmacy, Jof University, Saudi Arabia

Dr. Liang Chen
Wenzhou Medical University, Wenzhou, P. R. China

Dr. Francesca Castiglione
Department "G. Natta", Politecnico di Milano, Italy

Dr. Imam Emam Omar Gomaa
Faculty of Pharmacy, University for Modern Sciences and Arts (USA), Cairo - Egypt

Dr. Bassant Amari
UIPS, Punjab University, Chandigarh, Punjab, India
MOST READ

PHARMACEUTICAL QUALITY AUDITS: A REVIEW
1079

CHALLENGES IN FORMULATING HERBAL COSMETICS
583

OVERVIEW ON FLOATING DRUG DELIVERY SYSTEM
785

FORMULATION, STANDARDIZATION, AND EVALUATION OF POLYHERBAL DISPERSIBLE TABLET
530

QUANTITATIVE ASSAY OF ASPIRIN AND (SALICYLIC ACID AND HEAVY METALS AS IMPURITIES) IN IRAQI'S MARKET ASPIRIN TABLETS USING DIFFERENT ANALYTICAL METHODS
425
Vol II, Special Issue 5 (Sep), 2019
4th International Conference on Pharmacy and Pharmaceutical Science (ICPPS) 2019
PUBLISHED: 15-09-2019

ORIGINAL ARTICLE(S)

ANTIBACTERIAL ACTIVITY OF ETHANOLIC EXTRACT BAWANG DAYAK (ELEUTHERINE BULBOSA (MILL.) URB) IN CREAM AGAINST PROPIONIBACTERIUM ACNES
SYAHIRDA DIAN ARDHANY, SUSI NOVARYATIN

ASSESSMENT OF THE QUALITY OF OUTPATIENT PRESCRIPTIONS FROM VARIOUS CLINICAL SETTING IN A TERTIARY HOSPITAL, SAUDI ARABIA
SULTAN M. AL-SHAHRANI

AMELIORATIVE EFFECT OF PHOENIX DACTYLIFERA ON ADVERSE EFFECTS OF LINEZOLID IN MALE ALBINO RATS
MAHMoud AHMED ABDUH SAID, SAYED A. AZIZ, SAMEH M. ELNAGTY

ANTIBACTERIAL ACTIVITY OF CELERY LEAVES (APIUM GRAVEOLENS L.) FORMULATED IN TOOTHPASTE AGAINST STREPTOCOCCUS MUTANS
ERZA GENATRIKA, FITA SATRIANI, INDRI HAPSAKI

IN VITRO CYTOTOXIC AND APOPTOTIC ACTIVITIES OF SULFATED POLYSACCHARIDE FROM CODIUM EDULE P. C. SILVA AGAINST BREAST CANCER ADENOCARCINOMA
ARIANE MARIE G. BAYRO, MARY JHO-ANNE T. CORPUZ, ROSS D. VASQUEZ

THE ANTIBACTERIAL ACTIVITY OF BAWANG DAYAK (ELEUTHERINE BULBOSA (MILL.) URB) FROM CENTRAL KALIMANTAN AGAINST ACNE-CAUSING BACTERIA
SUSI NOVARYATIN, SYAHIRDA DIAN ARDHANY

IN VITRO ANTI-OHAGULANT AND ANTIOXIDANT ACTIVITIES OF PRASAPLAI RECIPE AND ZINGIBER CASSUMUNAR ROXB. EXTRACTS
METABOLITES PROFILE OF COLORECTAL CANCER CELLS AT DIFFERENT STAGES

HADZIYANA MOHD YUSOF, SHARANIZA AB-RAHIM, WAN ZURINAH WAN INGH, SHERLY NATHAN, RAHMAN A. JAMIL A., MUSLAMAH MAZLAN

EXPRESSION OF THE MICROFOLD CELLS IN THREE-DIMENSIONAL CO-CULTURE SYSTEM FOR IN VITRO CULTIVATION OF HUMAN NOROVIRUS

MIZANURRAFIK HIJAZI, SHARANIZA AB-RAHIM, MUHIDHAN MUHAMAD

ABERRANT N-GLYCOSYLATION REGULATES INVASION OF MG-63 CELLS THROUGH EXTRACELLULAR MATRIX REMODELING

SAPMILA HAMID MUSTAFA, MUHIDHAN MUHAMAD, SHARANIZA AB-RAHIM

TOCOTRIENOL-RICH FRACTION MODULATE THE PHOSPHOINOSITIDE 3-KINASES/AKT SIGNALING PATHWAY GENES AND PREVENT OXIDATIVE STRESS IN NICOTINE-INDUCED PRE-IMPLANTATION EMBRYOS

NURUL HAMIRA KAMSAR, SHARANIZA AB-RAHIM, YUKANIZA SHAFINIE KAMSAR, NOR ASHIKIN MOHAMED NOOR KHALIM, MOHD HAMIM RAHIEN

ANTIOXIDANT AND FREE RADICAL SCAVENGING ACTIVITY OF HIBISCUS ACETOSELLA LEAVES EXTRACTS

THASKEERIN DUMROMPHUANTI DECHA, SURACHADEE THUNGMUNTHONG, Warihthee Khosaj, NAKINTWALAI WISIDSRI, SURACHAI TECHAEOR

CYTOTOXIC ACTIVITY EVALUATION OF ERIOCaulON CINEREUM R.B.R. ON HELA AND VERO CELL LINES

PINUS LIMBAYATNO, ARDE TOGA NUGRAHA, ADI ALIA TRI HIDAYATI, BAIG RISKY WAHYU LISNASARI, WIDYANUR MAYA DIAHANDARI, NANNANG FAKHRUDIN

CYTOTOXIC ACTIVITY OF ERIOCaulON CINEREUM R.BR. TO MCF-7 AND VERO CELL LINE

ARDE TOGA NUGRAHA, ASGAR PURNAWI, SITI NURUL KOMARIAH, HADY ANSHORI T.

DISSOLUTION ENHANCEMENT OF TETRAHYDROCURCUMIN USING OPTIMIZED SELF-NANOEMULSIFYING DRUG DELIVERY SYSTEM

IKA YUNI ASTUTI, TRI SULIAJATI, RETNO WAHYUNINGRUM

EVALUATION OF ACETYLCHOLINESTERASE ACTIVITY AND CYTOTOXICITY OF DIFFERENT PARTS OF NELUMBO NUCIFERA GAERTN ON HUMAN NEUROBLASTOMA CELL LINE (SH-SYSY)
THE ANTI-INFLAMMATORY ACTIVITY OF ESSENTIAL OIL OF CLOVE (SYZYGIUM AROMATICUM) IN ABSORPTION BASE OINTMENT WITH ADDITION OF OLEIC ACID AND PROPYLENE CYLCOOL AS ENHANCER
NING SURAKARTINI, RANI PRABANDARI, TEDJO YUWONO, DEKSY RESTIA RAHMAWATI

BIOLOGICAL ACTIVITY OF SS-GLUCANS FROM EDIBLE MUSHROOM, SCHIZOPHYLLUM COMMUNE IN THAILAND
SARRAJ RATTANADILOK (N. A. PHUKET, TITIMA SANGKAEW, FYATIDA CHANAPAN, SURACHAI TECHAOEI

IN VITRO ANTMIICROBIAL ACTIVITY OF SOME ESSENTIAL OILS AGAINST BACTERIAL PATHOGENS CAUSING SKIN DISEASES IN VAPOR PHASE
LUIT PATTAVANANIT, SUNISA MITHONGLANG, SUNITA MITHONGLANG, SURACHAI TECHAOEI

THE EFFECTS OF CURCUMIN AND VITAMIN D COMBINATION AS INHIBITOR TOWARD SALMONELLA TYPHI BACTERIA GROWTH IN VIVO
AMI FEBRIZA, VIVEN NOVARIANA A. KASIM, HASTA HANDAYANI IDRUS, MOCHAMMAD HATTA

ANTIBACTERIAL ACTIVITIES OF SAPODILLA FRUIT EXTRACT INHIBITING SALMONELLA TYPHI ON MICE BALB/C
HASTA HANDAYANI IDRUS, MOCHAMMAD HATTA, AMI FEBRIZA, VIVEN NOVARIANA A. KASIM

THE EFFECT OF PSYCHOLOGICAL STRESS ON MPF INTRAFOLOCCULAR
REV'T G. M. NOVKA, BUDI SANTOSO, WIDIWATI WIDIWATI

EFFECT OF SIMVASTATIN ON HISTOPATHOLOGY OF THE HEART AFTER 5/6 SUBTOTAL NEPHRECTOMY
PUTU NITA CAHYAWATI

THE EFFECT OF HOMALANTHUS POPULNEUS (GIESEL.) PAX. EXTRACT IN EXPRESSION OF T-CELL RECEPTOR: INHIBITION STUDY OF HIV INFECTION
SINTYA E., WIJAYANTI N., NOREAENI A.

IN VITRO ENTRAPMENT AND RELEASE STUDIES OF LEVOFLOXACIN USING EPICHLOROHYDRIN-CROSSLINKED HYDROGEL

https://innovareacademics.in/journals/index.php/ijap/article/view/6371
DIGITAL HEARING AID SIGNAL PROCESSING SYSTEM USING ANDROID PHONE
YEH-HUI ANG GOH, YOON-KET LEE, MURUARIY WIP, KIOK-SENG E. LI, YANN CHEE GOH, KIN-YUN LUM

AN APPROACH FOR QUANTITATIVE EVALUATION OF TRANSFEMORAL PROSTHESIS SOCKET BY FINITE ELEMENT ANALYSIS
L. E. VAN TIJN, AKIHITO HANAFUSA, SHINICHIRO YAMAMOTO

APPLICATION OF LASER-INDUCED BREAKDOWN CAVITATION BUBBLES FOR CELL LYSIS IN VITRO
DARINA JASKOVA, MIROSŁAWA RYSKA, MIHAIL KOTEK

EVALUATION OF CEFOPERAZONE/SULBACTAM AND VITAMIN K USE IN PATIENTS WITH BACTERIAL INFECTIONS
THEERAPONG SEESIN, PIPITONG PENGSUFSIN, SARAYUT WEESAPHEN, PEERAYA SRIPHONG, UAEPOONG LIMPAPANASIT, SIRIN BHONGCHIRAWATTANA

CONTINUED IN 2022

How we claim? Click Scopus indexing LJAP 2022 to learn and understand
CORRELATION OF RADIOPHAGIC DAMAGE AND METABOLIC SYNDROME IN SPONDYLOARTHRITIS: A CROSS-SECTIONAL STUDY

HENDRA GUNAWAN1*, SONY WIBISONO MUDJANARKO2, AWALIA2, LITA DIAH RAHMAWATI3, JOEWONO SOEROSO4, AGUNG PRANOTO2

1Department of Residence of Internal Medicine, Dr. Soetomo General Hospital Surabaya - Airlangga University, Indonesia. 2Department of Internal Medicine - Endocrinology, Metabolic, and Diabetes Division, Dr. Soetomo General Hospital, Surabaya, Indonesia – Airlangga University, Indonesia. 3Department of Internal Medicine – Rheumatology Division, Dr. Soetomo General Hospital, Surabaya, Indonesia - Airlangga University, Indonesia. Email: Sylvesterjgunawan@gmail.com/Awalia_nov74@yahoo.com

Received: 08 August 2019, Revised and Accepted: 08 August 2019

ABSTRACT

Background: Cardiovascular complication remains the long-term complications in spondyloarthritis (SpA). Previous studies revealed that metabolic syndrome is the risk factor of cardiovascular in SpA patients. Previous studies also revealed that the prevalence of the metabolic syndrome in 34.9–45.7% in SpA patients. However, previous studies also revealed the prevalence of the correlation of SpA disease activity with metabolic syndrome.

Aim: The aim of the study was to investigate the correlation of SpA radiographical damage measured with a modified Stöke Ankylosing Spondylitis Spinal Score (mSASSS) score with metabolic syndrome in SpA patients, which routinely visited Rheumatology Outpatient Department in Dr. Soetomo General Hospital.

Methods: An observational study with cross-sectional design with consecutive sampling technique was conducted in July–October 2018. All SpA patients who fulfilled the inclusion criteria were included in this study. Data analysis was performed with SPSS v21.0.

Results: There were 33 SpA patients (10 males and 23 females) included in this study. The average age was 48.18±11.27 years-old. The average mSASSS score was 24.36 [K0.93; p=0.00]. Metabolic syndrome was diagnosed in 54.5% patients with central obesity, 66.7% had increased blood pressure, 61.5% had impaired fasting glucose, 55.6% had increased triglycerides, and 77.8% had decreased high-density lipoprotein cholesterol. Positive correlation between mSASSS score and metabolic syndrome was observed (r=0.510, p=0.002).

Conclusion: A correlation between SpA disease activity measured with mSASSS score and metabolic syndrome was observed. Therefore, routine metabolic syndrome screening is strongly suggested for SpA patients.

Keywords: Metabolic syndrome, Spondyloarthritis, Modified stoke ankylosing spondylitis spinal score.

BACKGROUND

Spondyloarthritis (SpA) is a chronic inflammatory disorder which is related to the presence of HLA-B27. SpA has various clinical symptoms ranging from chronic inflammatory back pain, peripheral arthritis, to enteropathy arthritides, and uveitis [1,2]. Among its long-term complication, cardiovascular complications remain the leading morbidity and mortality in SpA patients. Previous studies revealed that cardiovascular complications risk such as myocardial infarction and cerebrovascular accident are accelerated in SpA population [3,4].

One of the cardiovascular risk factors is metabolic syndrome. It is a constellation of obesity, insulin resistance, hypertension, and dyslipidemia [5]. Mottillo et al. revealed that metabolic syndrome increases the risk of cardiovascular complications at least two-fold and all-cause mortality by at least 1.5-fold. Previous studies also revealed that the prevalence of the metabolic syndrome is increased in SpA patients, ranging from 34.9% to 45.7% [6,7]. Interestingly, current understandings of metabolic syndrome have suggested that metabolic syndrome is associated with chronic low-grade inflammation [8]. The mechanism remains uncertain, but it involves proinflammatory cytokines such as tumor necrosis factor-α (TNF-α) and interleukin (IL)-6 which contributes to the insulin resistance, central obesity, dyslipidemia, and hypertension [9,10].

Despite the increased prevalence in rheumatic diseases, few studies have reported the correlation of SpA disease activity and functional score to metabolic syndrome with various outcomes [6,7,10-12]. However, as SpA disease activity score such as bath-AS ankylosing spondylitis disease activity index (BASDAI) is dependent on subject’s psychological and functional state, it may not reflect the severity of SpA [13, 14]. Radiographic assessment can be used to assess the severity of SpA using modified Stöke Ankylosing Spondylitis Spinal Score (mSASSS) [15]. Furthermore, assessing radiographic damage can evaluate therapy response, the progression of the disease, and associated with magnetic resonance imaging [16]. This study aimed to investigate the correlation of radiographical damage, measured with mSASSS score with metabolic syndrome in SpA patients.

METHODS

This study is a cross-sectional study conducted from July 2018 to October 2018 in Rheumatology Outpatient installation Dr. Soetomo General Hospital Surabaya, an A class hospital with consecutive sampling technique to recruit the subject. This study has been approved by the Ethics Committee of Dr. Soetomo General Hospital on July 10, 2018, with reference number: 0385/KEPK/VII/2018.

Study population

Consecutive patients (n=33; 10 males and 23 females; mean age 48.18±12.27 years) attending the Rheumatology Outpatient Department of Dr. Soetomo General Hospital Surabaya between July 2018 and September 2018, were enrolled in the study. All patients fulfilled the ASAS 2010 criteria for SpA [1]. The exclusion criteria in...
this study are smoking, previous alcohol consumption, chronic kidney disease, previous medications (glucocorticoid and anti-TNFα), history of malignancy, infection (HIV and hepatitis), and other autoimmune diseases. The median of disease duration was 4 years (0-43 years) and six patients were diagnosed with SpA at the time of the recruitment. Nineteen patients were taking sulphasalazine with median dose 1000 mg/day (500-2000 mg/day) and eight patients were taking methotrexate with median dose 10 mg/week (7.5-10 mg/weekly). Fourteen patients were taking Anti-hypertensive drugs (angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers, β-blockers, or combination therapy), 19 patients were taking dyslipidemia drugs (statins or fibrates), and four patients were taking oral hypoglycemic agents (biguanides).

mSASSS score
Radiotherapy assessment was measured using mSASSS score. There are two components which are evaluated in mSASSS score, the anterior vertebral which consist of the lower border of C2 to the upper border of Th1 and the lumbar vertebral which consist of the lower border of Th12 to the upper border of S1 combined to 24 vertebral segments at a lateral view. The vertebral segments were evaluated for the presence of erosion and/or sclerosis and/or squaring (1 point), syndesmophyte (2 points), and bridging syndesmophyes (three points). The total score ranges from 0 to 72 [15]. The radiology assessment was performed by two rheumatologists (Awalia and Lita Diah) who were blinded to demographic and clinical manifestations. Both readers scored the radiography assessment at the same time and registered the charges of vertebral segments separately; therefore, both scores could be computed.

Metabolic syndrome
Metabolic syndrome was assessed with National Cholesterol Education Program Adult Treatment Panel (NCEP-ATP III) criteria. According to NCEP-ATP III, metabolic syndrome is defined as the presence of minimal three of the following five risk factors such as (1) central obesity, (2) elevated triglycerides (>150 mg/dL) or previous dyslipidemia medication, (3) fasting glucose >100 mg/dL or previous diabetes medication, (4) blood pressure >130/80 mmHg, and (5) high-density lipoprotein (HDL) <40 mg/dL for male and <50 mg/dL for female [17]. As for central obesity, we used the modified criteria of central obesity based on waist circumference >90 cm for male and >80 cm for female or body mass index for Indonesian populations which defines overweight at 23.0-24.9 kg/m², obese I at 25.0-29.9 kg/m², and obese II at ≥30 kg/m² [16,19].

Statistical analysis
The statistical analysis was made by SPSS v21.0 software for MacOSX. Interobserver analysis of mSASSS score to validate the mSASSS score was performed with Cohen-Kappa analysis. Shapiro-Wilk test was used to test the normality of the mSASSS score, followed by Mann-Whitney U-test for mean differences of mSASSS score based on the presence of the metabolic syndrome. Spearman’s rank correlation was used for correlation analysis between mSASSS score and metabolic syndrome and the number of metabolic syndrome component.

RESULTS
Demography
There were 33 SpA patients who visited the rheumatology outpatient department from July to October 2018 consisted of 23 females and 10 males. There were 6 (18.1%) newly diagnosed SpA patients; therefore, 27 patients had a history of conventional synthetic disease-modifying anti-rheumatic drug (csDMARDs), with 8 patients (24.3%) on methotrexate, and 19 patients (57.6%) on sulphasalazine. No patients had a history of metabolic syndrome before diagnosed with SpA, smoking, alcohol consumption, chronic kidney disease, or anti-TNFα medication. Table 1 shows the basic characteristics of the subjects.

Prevalence of metabolic syndrome component in SpA patients
Fig 1 shows the prevalence of each component of metabolic syndrome in SpA patients. Central obesity was the most frequent metabolic syndrome component found in this study with a prevalence of 67%, followed with decreased HDL-cholesterol and impaired glucose tolerance. When we classified the patients with central obesity according to their body mass index (BMI) for Indonesian populations, we found that 92% met the obese criteria (10 with obese I and 10 with obese II) and 8% (two patients) met the overweight criteria.

About 42% (14 patients) of the patients met the criteria of elevated blood pressure or had an antihypertensive drug history before. When we classified patients with elevated blood pressure according to their blood pressure with JNC VII criteria, we found that 42% (9 out of 14) met the criteria of hypertension Stage 1, 29% (4 out of 14) met the criteria of hypertension Stage II, and 29% (4 out of 14) had a normal blood pressure.

The prevalence of impaired glucose tolerance was 46% (15 patients) in this study, with 27% (4 out of 15) had already been diagnosed with type 2 diabetes mellitus. All patients with diabetes received oral antidiabetic drugs (biguanides).

The prevalence of elevated triglycerides was 42% (14 patients) in this study. All patients with elevated triglycerides were on statins. When we classified the patients according to their triglycerides level with NCEP-ATP III classification, we found that 43% (6 out of 14) were on borderline-high triglycerides (150–199 mg/dL), 43% (6 out of 14) were on high triglycerides (200–499 mg/dL), and 14% (2 out of 14) were on normal triglycerides level.

The prevalence of decreased HDL-cholesterol was 59% (19 patients) in this study with 73.7% (14 out of 19) were on statins. When we classified the patients according to their HDL-cholesterol level with NCEP-ATP

Table 1: Basic characteristics of the study

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>50 (22-72)</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>80 (60-100)</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>26.45 (17.48-36.07)</td>
</tr>
<tr>
<td>Blood pressure</td>
<td></td>
</tr>
<tr>
<td>Systolic (mmHg)</td>
<td>120 (100-170)</td>
</tr>
<tr>
<td>Diastolic (mmHg)</td>
<td>80 (70-90)</td>
</tr>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>12.7 (9.3-15.9)</td>
</tr>
<tr>
<td>Leucocytes (u/L)</td>
<td>7910 (3400-14450)</td>
</tr>
<tr>
<td>Platelets (u/L)</td>
<td>326000 (206000-555000)</td>
</tr>
<tr>
<td>Fasting glucose concentration (mg/dL)</td>
<td>97 (78-284)</td>
</tr>
</tbody>
</table>

Total cholesterol (mg/dL) | 194 (115-255) |
Triglycerides (mg/dL)     | 115 (45-572)  |
HDL-cholesterol (mg/dL)   | 47 (31-99)    |
LDL-cholesterol (mg/dL)   | 118 (46-157)  |
Duration of disease (years)| 4 (1-43)     |
mSASSS score              | 23 (9-60)     |
On ant-hypertensive (%)   | 14 (42)       |
On statins (%)            | 14 (42)       |
On oral antidiabetic drugs (%) | 4 (12)     |

mSASSS: Modified ankylosing spondylitis spinal score

![Fig 1: Prevalence of the metabolic syndrome components in spondyloarthritides patients](image-url)
III classification, we found that 47% (9 out of 19) were on low level (<40 mg/dL), 47% (9 out of 19) were on normal level, and 6% (1 out of 19) were on a high level of HDL-cholesterol (>60 mg/dL).

**Prevalence of metabolic syndrome in SpA patients**

The prevalence of metabolic syndrome in this study was 54.5% (18 out of 33 patients) according to the NCEP-ATP III classification of metabolic syndrome modified for Indonesian populations. When we split the patients based on metabolic syndrome diagnosis, we found that 44.4% (8 out of 18) had three components of metabolic syndrome, 38.9% (7 out of 18) had four components of metabolic syndrome, and 16.7% (3 out of 18) had five components of metabolic syndrome as shown in Fig. 2.

Table 2 describes the metabolic syndrome parameters in SpA patients according to the presence of the metabolic syndrome. When we classified the patients according to the presence of metabolic syndrome, we found that patients with metabolic syndrome were significantly older (p=0.003) and had a longer duration of diseases (p=0.000). All patients with metabolic syndrome had central obesity (100%), had a significantly greater waist circumference (p=0.002), and BMI (p=0.006) compared with patients without metabolic syndrome.

![Fig. 2: The distribution of metabolic syndrome components according to metabolic syndrome](image)

Elevated blood pressure was observed in 66.67% (12) patients with metabolic syndrome, however, there were no significant differences in systolic and diastolic blood pressure in patients with and without metabolic syndrome (p=0.213 and p=0.195, respectively).

Impaired glucose tolerance was more prevalent in patients with metabolic syndrome (61.5%) compared to those without metabolic syndrome (13.3%). When we compared the fasting glucose concentration, we found a higher glucose concentration in patients with metabolic syndrome than those without metabolic syndrome (p=0.000).

Increased triglycerides were observed in 61.5% (11) patients with metabolic syndrome, compared to 26.7% (4) in patients without metabolic syndrome. There were no significant differences in triglycerides level in patients with and without metabolic syndrome (p=0.093). Similarly, the prevalence of decreased HDL-cholesterol was higher in patients with metabolic syndrome (77.8%) compared to patients without metabolic syndrome (33.3%). There were no differences in HDL-cholesterol levels in patients with or without metabolic syndrome (p=0.128).

**mSASSS score**

The median score of mSASSS score in this study was 23, as shown in Table 1 with interobserver agreement calculated with Cohen-Kappa's method K=0.93, p=0.00. When we compared the mSASSS score according to the presence of metabolic syndrome, we found that patients with metabolic syndrome had higher mSASSS score compared to those without metabolic syndrome (p=0.004).

**Correlation of mSASSS score and metabolic syndrome in SpA patients**

Correlation of mSASSS score and metabolic syndrome was calculated with Spearman correlations. We found a moderate correlation between mSASSS score and metabolic syndrome (p=0.510, p=0.002). We also found a weak correlation between mSASSS core and the number of metabolic syndrome components (p=0.448, p=0.009).

**DISCUSSION**

SpA is a chronic inflammatory disease with various clinical manifestations, ranging from ankylosing spondylitis to undifferentiated arthritis. It affects male predominantly with male: female ratio 2:3:1 [20]. However, female was more predominant in this study, accounts for 67% subjects in this study with an average age 48 years old. This supports the previous study which reported that the male: female ratio

**Table 2: Characteristic of spondyloarthritis patients according to the presence of the metabolic syndrome**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Metabolic syndrome</th>
<th>No (n=15)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Yes (n=18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male [%]</td>
<td>4 (22.2)</td>
<td>6 (40)</td>
<td>0.003*</td>
</tr>
<tr>
<td>Female [%]</td>
<td>14 (77.8)</td>
<td>9 (60)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>52 (39–72)</td>
<td>44 (22–63)</td>
<td></td>
</tr>
<tr>
<td>Central obesity (%)</td>
<td>18 (100)</td>
<td>4 (26.7)</td>
<td>0.002*</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>91.5 (82–108)</td>
<td>77 (68–106)</td>
<td>0.000*</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>30.06 (23.63-36.07)</td>
<td>21.63 (17.48-31.25)</td>
<td>0.123</td>
</tr>
<tr>
<td>Elevated blood pressure (%)</td>
<td>12 (66.67)</td>
<td>2 (13.3)</td>
<td></td>
</tr>
<tr>
<td>Systolic (mmHg)</td>
<td>135 (100–170)</td>
<td>120 (110–160)</td>
<td>0.185</td>
</tr>
<tr>
<td>Diastolic (mmHg)</td>
<td>80 (70–90)</td>
<td>80 (70–90)</td>
<td></td>
</tr>
<tr>
<td>Impaired glucose tolerance (%)</td>
<td>11 (61.5)</td>
<td>2 (13.3)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Fasting glucose concentration (mg/dL)</td>
<td>103 (86–284)</td>
<td>93 (78–103)</td>
<td>0.093</td>
</tr>
<tr>
<td>Increased triglycerides [%]</td>
<td>10 (55.6)</td>
<td>4 (26.7)</td>
<td></td>
</tr>
<tr>
<td>Decreased HDL-cholesterol [%]</td>
<td>142.5 (60–372)</td>
<td>104 (45–203)</td>
<td>0.128</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dL)</td>
<td>14 (77.8)</td>
<td>5 (33.3)</td>
<td></td>
</tr>
<tr>
<td>Duration of disease (years)</td>
<td>7.5 (1–43)</td>
<td>2.25 (1.25–7.25)</td>
<td>0.000*</td>
</tr>
<tr>
<td>mSASSS score</td>
<td>26 (18–60)</td>
<td>20 (9–29)</td>
<td>0.004*</td>
</tr>
</tbody>
</table>

*Significant with Mann-Whitney U-test analysis (p<0.05). mSASSS: Modified spondyloarthritis spinal score.
is equal in older populations (45 years old) and female was associated with lower quality of life and more functional limitations despite lower degrees of radiographical damage [21,22]. The reason female was predominant in this study because our study location is referral hospital. Thereby, our cases were difficult cases which is commonly found in female with as [Skare et al, 2012].

The prevalence of metabolic syndrome in this study was 54.5%, which was higher compared to the prevalence of metabolic syndrome in a healthy population that visited primary health care in [alaska], which was 28.4% [23]. This finding supports previous studies which reported that the prevalence of metabolic syndrome in SpA populations is higher than the healthy population [3,24]. Compared to other studies, Malesci et al reported that the prevalence of metabolic syndrome in SpA patients in Italy was 45.8% [6]. Maia et al, which observed metabolic syndrome in Brazilian ankylosing spondylitis patients and Papadakis et al, which observed metabolic syndrome in male Greek ankylosing spondylitis patients reported that the prevalence of metabolic syndrome was 27% and 54.9%, respectively [7,11]. The differences between this study and previous studies might be due to the differences in the definition of metabolic syndrome, which was used in some of the previous studies [25].

Analyzing the component of metabolic syndrome, central obesity was the most common metabolic syndrome's component found in this study, followed by decreased HDL-cholesterol and impaired glucose tolerance. These findings are different from previous studies since elevated blood pressure was the more prevalent metabolic syndrome's component. This might be due to the predominant gender differences in our study in which female was the more predominant, with average age 48 years, and 69.6% of the female were in the menopausal period. Menopause is associated with hyperandrogenemia which associated with insulin resistance and abdominal fat disposition [26].

When we analyzed the patients according to the presence of metabolic syndrome, we found that central obesity was still the more prevalent metabolic syndrome component in SpA patients with metabolic syndrome followed by decreased HDL-cholesterol, elevated blood pressure, and impaired glucose tolerance. These findings support previous studies which reported that SpA patients with metabolic syndrome were older and had more cardiovascular comorbidities than those who did not have metabolic syndrome [7,11]. Because all patients in this study were not on anti-TNFα, we thought that chronic inflammation due to TNFα activation might have a part in the adverse metabolic parameter in this study [9,24].

To the best of our knowledge, this is the first study which observed the mSASSS score in Indonesian population. The average mSASSS score in this study was higher than the previous studies indicated that there was more radiographical damage in our patients [15,27]. This might due to the nature of SpA, which is chronic progressive and patient's characteristics in this study. All patients in this study were referral cases, so the possibility of late referral cases needed to be accounted [28]. While we assessed the mSASSS score based on metabolic syndrome, we found that the average mSASSS score in patients with metabolic syndrome was significantly higher than those who did not have metabolic syndrome. This finding is the first one who observed mSASSS score in patients with metabolic syndrome. This supports the hypothesis that inflammation in the entheses would increase the activation of IL-17, which further activates the IL-23/IL-17 axis [29]. Golden et al. reported that activation of IL-23/IL-17 axis in entheses would not only affect local inflammation but also associated with extra-articular complications of SpA [30].

This is the first study which observed the positive correlation of mSASSS score and metabolic syndrome number of metabolic syndrome components in SpA patients. These findings supported the findings of Papadakis et al, in male Greek ankylosing spondylitis patients and Alonso-Blanco et al, in Spanish ankylosing spondylitis patients [7,10]. However, our study used other methods such as BASDAI and BAPPI in which both methods evaluate disease activity from the patient's perception of their disease [31,32]. Thus, we thought that the severity of inflammation evaluated with mSASSS score was more objective to evaluate the duration of long-term inflammation in SpA; however, further studies are needed to evaluate the relationships between mSASSS score and long-term complication of SpA.

This study has some limitations. We analyzed small numbers of patients with cross-sectional design in relatively limited time; therefore, the cause-effect relationships between chronic inflammation in SpA and metabolic syndrome could not be determined. The location of this study is in A class hospital; therefore, all patients were referral cases, and it could affect the higher mSASSS score in this study.

CONCLUSION
Our findings showed that the greater prevalence of metabolic syndrome in chronic inflammatory diseases, in this case, was SpA. The correlation of radiographical damage evaluated by mSASSS score with metabolic syndrome and number of metabolic syndrome components suggested the role of inflammation to the pathogenesis of metabolic syndrome in SpA patients. Early diagnosis and treatment of metabolic syndrome in SpA patients are needed to prevent cardiovascular complications.

ACKNOWLEDGMENT
We acknowledge Poernomo Bondi Setiawan, dr Sp.PD-KGEH as the head of Internal Medicine Department of Airlangga University for giving us permission to manage and write this case report. We also acknowledge all staffs in Internal Medicine Department for the support given to us.

CONFLICTS OF INTEREST
The authors declare that there are no conflicts of interest regarding the publication of this article.

REFERENCES


Source details

International Journal of Applied Pharmaceutics
Scope coverage years: from 2011 to Present
Publisher: International Journal of Applied Pharmaceutics
ISSN: 0975-7058
Subject area: Pharmacology, Toxicology, and Pharmaceutics (Pharmacological Sciences)
Source type: Journal

CiteScore 2021: 1.5
SJR 2021: 0.195
SNIP 2021: 0.550

CiteScore rank & trend
Scopus content coverage

CiteScore Tracker 2022
1.5 - 1,938 Citations 2018 - 2021
1,288 Documents 2018 - 2021

CiteScore rank 2021
Category: Pharmacology, Toxicology, and Pharmaceutics
Rank: 40th