CASE REPORT

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A patient with Type 2 Diabetes Mellitus (T2DM) with Fournier gangrene: a case report

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ABSTRACT

Background: Fournier gangrene is necrotizing fasciitis of the genitalia and perineum that can extend to the abdominal wall, gluteus or lower extremities. Predisposing factors for Fournier gangrene include obesity, diabetes mellitus (DM), alcoholism, smoking, hypertension, chronic kidney disease, perianal trauma and immunosuppressive conditions. This case report aims to evaluate the management of Fournier gangrene on metabolic and surgical treatment.
Case Presentation: A-53 years old-female with Type 2 Diabetes Mellitus (T2DM) came to the Emergency Ward of Dr. Sutomo General Hospital, Surabaya, with the chief complaint of sores on the buttocks for 1 week. The patient was diagnosed with Fournier gangrene. On physical examination in the room, erythematous macular lesions were found in the folds of the breast and armpit on chest examination. Obtained scratch marks were found because the patient is often scratched. The wound from the buttock and keep enlarged due to the Fournier gangrene (necrotizing infection). In this case, the patient was given the antibiotics ceftriaxone and metronidazole. The patient died during the 8th day of treatment due to a suspected septic shock.
Conclusion: Surgical management in this patient is debridement. Multi-disciplinary management of obstetrics, urology, digestive surgery, and plastic surgery is required for the management of Fournier gangrene in T2DM patients.

Keywords: Fournier Gangrene, Type 2 Diabetes Mellitus.
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INTRODUCTION

Fournier gangrene is necrotizing fasciitis of the genitalia and perineum that can extend to the abdominal wall, gluteus or lower extremities. Fournier gangrene was first reported by Jean Alfred Fournier, a dermatologist and venereologist from France; he reported five cases of men who developed fatal gangrene in the genital area.[1]

Fournier gangrene, including rare cases, studies in the United States of America show an incidence of 1.6 per 100,000 men per year with a male to female ratio of 40:1. Incidence increases and peaks at the age of 50 years, with an incidence of 3.3 cases per 100,000 men per year.[2] The principle of treatment in Fournier's gangrene is adequate drainage, debridement, and systemic antibiotics. Mortality and morbidity rates are still quite high due to the rapid progression of endotoxic shock, DIC, and MOF. Systemic disorders that can also be caused by this disease include fever, tachycardia, electrolyte balance disorders, hyperglycemia.[3]

The death rate for Fournier Gangrene is 45%. Most cases are occurred in men compared to women (10:1).[4] Wound cultures are mostly polymicrobial, consisting of aerobes and anaerobes. *E. coli* is reported to be the most common cause of Fournier's gangrene. Anaerobic bacteria are very rare. *Porte de entry* organisms are known from the gastrointestinal tract (49.2%), genitourinary tract (43.3%), and skin (7.5%). Wound pathogenesis is a suppurative bacterial infection that causes enzymatic activation, platelet aggregation, inflammatory reactions that trigger local micro thrombosis in subcutaneous blood vessels and tissue destruction.[4] Predisposing factors for Fournier gangrene include obesity, diabetes mellitus, alcoholism, smoking, hypertension, chronic kidney disease, perianal trauma and immunosuppressive conditions.[5]

Based on those mentioned above, this case report aims to evaluate the recent management of a patient with Type 2 Diabetes Mellitus (T2DM) with Fournier gangrene at Dr. Sutomo General Hospital, Surabaya, Indonesia.

CASE DESCRIPTION

A female, 53 years old, came to the Emergency Ward of Dr. Sutomo General Hospital with the chief complaint of sores on the buttocks for 1 week. The wound is getting more painful. At first, the patient felt ulcers on the buttocks due to itching and scratching until sores appeared. The patient feels the wound in the buttocks is getting swollen and painful. The wound is felt to be getting wet and there is a smelly yellow liquid in the buttocks. The family said that since the patient was injured, the patient rarely moved because it hurt when he moved. The patient tends to sleep on the right side because of pain in the buttocks. Prior to the MRS at RSUD DR SOETOMO, the patient had been treated for wounds by a nurse in the village, but because she was not feeling well, he was referred to Soetomo. The patient has also felt a fever since 1 week of SMRS and her appetite also decreased because the patient complained of nausea without vomiting. Her stomach feels full and hard. The patient does not defecate for 1 week because if straining, it hurts. The patient can still fart, but if the

fart feels pain in the anal area. The patient complained of itching in the armpits, breast folds, groin accompanied by brown spots. Complaints of these brown spots have been felt for more than a month. The patient has a history of diabetes and high blood pressure. Diabetes suffered for more than 8 years with glimepiride 2 mg and metformin 500 mg every 12 hours. At the same time, the drug for high blood pressure is amlodipine 10 mg every morning. Another drug taken is simvastatin every night because the patient has a history of high cholesterol. The patient's family admitted that the medicine was not taken regularly because it was often forgotten. The patient can still fart, but if the fart feels pain in the anal area. The patient complained of itching in the armpits, breast folds, groin accompanied by brown spots. Complaints of these brown spots have been felt for more than a month.

On physical examination in the room, the patient was conscious of compos mentis, blood pressure 110/70 mmHg, pulse 100x/minute, regular, lifting strength, respiratory rate 20x/minute, regular, axillar temperature 36.3°C. The body weight was 75 kg, followed by height (158 cm) and Body Mass Index (BMI) 30.04 kg/m^2. The lips were dry and slightly peeling on oral examination-anemic conjunctiva. No enlarged lymph nodes were found in the neck region. On chest examination, erythematous macular lesions were found in the folds of the breast and armpit. Obtained scratch marks because the patient is often scratched. On abdominal examination revealed bowel sounds 8-20 x/minutes. In the genital area of the rectum, there was a wound measuring 30 cm x 40 cm with a depth of 20 cm until it reached the sacrum, anus, and there were abscesses and necrotic tissue surrounded by active hyperemic lesions. Consultation in urology found no abnormalities in the field of urology. The consultation results in obstetrics did not reveal any obstetric abnormalities. The results of the skin consultation showed that tinea corporis was given griseofulvin 2x500 mg. The results of the cardiothoracic surgeon consultation were wound care and the antibiotic ceftriaxone 2x1 g based on the blood sugar regulation.

Laboratory results: Hemoglobin (Hb) 12.3 g/dl, Hematocrit (Ht) 36.1%, Leukocytes (WBC) 27.49 x10^3//µl , Platelets (PLT) 367 x 10^3/µl, Neutrophils 91%, Lymphocytes 4.9%, Eosinophils 0.1%, Monocytes 3.6%, BUN 26 mg/dl, Serum Creatinine (SC) 0.88 mg/dl, Random Blood Glucose (RBG) 42 mg/dl, SGOT 68 U/L, SGPT 30 U/L, albumin 2.8 g/dl, sodium 124 mmol/l, potassium, 3.7 mmol/l, chloride 86 mmol/l, pH 7.50, pCO2 26,8 mmHg, pO2 84 mmHg, HCO3 21.6 mmol/l, BE -1.6 mmol/l, and SO_2 97.4%. HBsAg is non-reactive (Table 1). X-ray chest radiography indicates cardiomegaly (CTR 60%). Urine culture did not find any germ growth in August 12th 2019.

Blood culture dated August 15th 2019, did not find any germ growth. On August 14th 2019, Pus culture showed the growth of *Escherichia coli* and *Staphylococcus aureus*. *Escherichia coli* bacteria are sensitive to antibiotics: chloramphenicol, levofloxacin, cefotaxime, fosfomycin, aztreonam, and ertapenem meropenem, amoxicillin-clavulanate, ampicillin, amikacin, piperazine sulbactam, ampicillin-sulbactam, ceftoxanthin, ceftazidime, while intermediate to cefazoline. Other germs found were Staphylococcus aureus with sensitive antibiotics, namely amoxiclav, chloramphenicol, ciprofloxacin, gentamicin, erythromycin, clindamycin, levofloxacin, moxifloxacin, oxacillin, quinoprisdime, tetracycline, cotrimoxazole, foscillin, while tetracycline was resistant to ampiline, penicillin. From the data above, the patient was diagnosed with Sepsis, Fournier's gangrene, hypovolemic hypotonic hyponatremia, hypoalbumin, DM post hypoglycemia due to low intake. The treatments were diet B1 1900 kcal/day, injection of Ceftriaxone 1 gram every 12 hours, injection of ranitidine 50 mg/12 hours, injection of ketorolac 1 ampoule every 8 hours, injection of metronidazole 500 mg every 8 hours, paracetamol 500 mg every 8 hours, infusion of 20% albumin until albumin > 2.5 g/dl.

On the first day of treatment, the patient complained of buttock pain, decreased appetite, fever, and itching in the armpits and breast folds. The patient received infusion therapy of Nacl 0.9%: tutofusin: kalbamin = 2:1:1 with diet B1 1,900 kcal/day, injection of ceftriaxone 1 gram every 12 hours, injection of ranitidine 50 mg every 12 hours, injection of ketorolac 1 ampoule every 8 hours, injection of metronidazole 500 mg every 8 hours, oral paracetamol 500 mg every 8 hours, insulin delayed for examination of Fasting Blood Glucose (FBG) (75 mg/dl) and 2-Hour Postprandial Glucose Test (2HPPGT) (98 mg/dl).

On the second day of treatment, the patient complained of difficulty defecating and the stomach felt full because when pushing, the patient felt pain in the anus area. Decreased appetite but can eat a little bit. Blood glucose examination suggests 75 mg/dl (FBG) and 97 mg/dl (2HPPGT) without insulin and anti-diabetic medications. On the second day of treatment carried out by a cardiothoracic surgeon for wound care. Treatment on the second day the patient complained of itching in the armpits and under the chest crease, a consultation was carried out in the skin field, so that griseofulvin therapy was obtained 500 mg every 12 hours orally with added lactulose syrup 30 cc every 8 hours orally because the patient had difficulty defecating.

On the third day of treatment, the patient admitted that she had pain in her buttocks after treating the wound. A clean, not wet, and odorless gauze was applied during the examination. The patient's family saw no improvement after being treated for the wound. The patient can eat porridge little by little. The patient is still unable to defecate because of pain in the anus. The laboratory examination found hypoalbumin (2.4 mmol/l) and hypokalemia (2.7 mmol/l), so the treatment was added 20% albumin infusion given within 4 hours, KN2 infusion: Tutofusin: Kalbamin = 2:1:1.

On the fourth day of treatment, the patient was still weak, unable to defecate, and she could only fart, treated the wound by the cardiothoracic surgeon and took a pus culture. The laboratory found low albumin levels and then 20% albumin infusion was given in 4 hours. Wound care patients were followed by plastic and reconstructive surgeons during wound care. The wound was very deep, so plastic treatment was needed for flap consideration.

Table 1. Laboratorium parameters of the patient during the study period.

Variables	9/8/19	12/8/19	13/8/19	16/8/19
WBC (10^3/µl)	27.49	12.28	10.09	10.75
Hb (g/dl)	12.3	10.3	10	9.5
Platelet (10^3/µl)	367	185	174	91
Eosinophils (%)	0.1	0.9	0.4	0.6
Basophils (%)	0.4	0.2	0.9	0.6
Neutrophils (%)	91	80.7	76.9	74.7
Lymphocytes (%)	4.9	11.1	13.3	15.7
Monocytes (%)	3.6	7.1	8.5	8.4
SGOT (U/L)	-	-	-	68
SGPT (U/L)	-	-	-	30
Albumin (g/dl)	2.8	2.4	2.2	2.6
Creatinine (mg/dl)	0.88	-	0.56	0.69
BUN (mg/dl)	26	-	15	9
Uric Acid (mg/dl)	-	-	5.8	-
RBG (mg/dl)	72	79	80	86
HbA1c (%)	11.4	-	-	-
Sodium (mmol/l)	124	130	130	136
Potassium (mmol/l)	3.7	2.7	3	2.5
Chloride (mmol/l)	86	85	91	95
Calcium (mmol/l)	-	6.6	6.8	7.1
Phosphorus (mmol/l)	-	0.9	0.8	0.5
Magnesium (mmol/l)	-	1.1	-	1.1
PTT (seconds)	11.4	-	-	-
APTT (seconds)	33	-	-	-
HbsAg	Non Reactive	-	-	-

WBC: White Blood Cells; Hb: Hemoglobin; SGOT: Serum Glutamic Oxaloacetic Transaminase; SGPT: Serum Glutamic Pyruvic Transaminase; BUN: Blood Urea Nitrogen; RBG: Random Blood Glucose; APTT: Activated Partial Thromboplastin Time; PTT: Partial Thromboplastin Time.

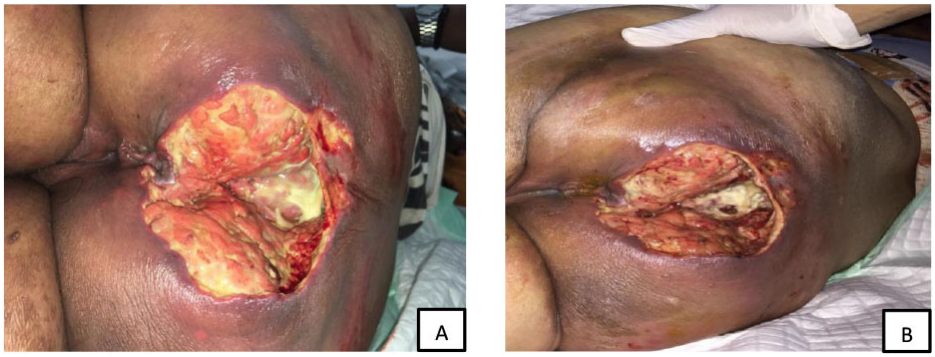

Figure 1. Follow-up debridement by plastic and reconstructive surgeon in (A) August 16th 2022 and (B) August 14th 2019.

On the fifth day of treatment, the patient complained of weakness. The patient only wanted to eat porridge and soft fruit. On that day, an evaluation was carried out by an obstetric and gynecologic urologist, and digestive surgeon to see any abnormalities caused by wounds on the buttocks.

On the sixth day, the patient complained of abdominal bloating and defecation could not be removed. Additional management is given glycerin suppository every morning as much as 50 cc. The results of the obstetric and gynecologic consultant found no abnormalities in the obstetric or gynecologic field and did not receive special treatment. The results of the urology consultant found no abnormalities in the field of urology and there was no special action in the field of urology. The results of the consultant digestive surgeon required a proctoscopy examination to see the presence of a fistula in the large intestine and the rectum schedule was adjusted by a plastic TS.

On the seventh day of treatment, the patient complained of fever and weakness. The patient was given additional therapy with paracetamol 500 mg every 8 hours orally. On the eighth day, a plastic and reconstructive surgeon was carried out wound care and the wound was wet with a smell mixed with fecal material. A digestive surgeon performed a proctoscopy on the same day, but the patient complained of pain when the procedure was carried out, so the proctoscopy was postponed (Figure 1). On the same day, the patient complained of sudden shortness of breath. The patient is apnea and the pulse is not palpable. The patient was resuscitated, but the patient was not saved. The patient was declared dead of septic shock.

DISCUSSION

Fournier gangrene is necrotizing fasciitis of the genitalia and perineum that can extend to the abdominal wall, buttocks or lower extremities. Necrotizing fasciitis is an important component of Fournier's gangrene. Such infections cause high mortality and morbidity rates. This is due

to the synergism of polymicrobial infection in the perineal, genital or perianal areas.[6]

Pathophysiology caused by necrosis of the skin, fascia scrotum, penis and perineum spread through the fascial planes to the pelvis and abdomen. This infectious process spreads to blood vessels, microcirculation disorders, and circulatory collapse. Immunocompromised causes microorganisms or germs to grow and multiply rapidly.[7] Bacterial virulence is caused by toxins or enzymes that provide a conducive environment for bacteria to multiply rapidly. In addition, the synergistic activity of polymicrobial also causes the spread of germs to be more aggressive. Thrombosis in blood vessels can stimulate the growth of facultative anaerobes and microaerophilic organisms due to tissue hypoxia. Lecithinases and Collagenases digest fascial barriers, opening the rapid spread of infection. Fulminant spread of Fournier gangrene may spread from the fascia, genitalia, perineum, pelvis, trunk and lower extremities.[7]

Etiology Fournier gangrene in men is triggered by incidental trauma, surgical trauma, foreign body, perianal or perirectal abscess, colonic perforation, urethral stricture with urinary extravasation, epididymo orchitis. In women triggered by septic abortions, vulvar or Bartholin gland abscess, hysterectomy. Children started by strangulation, inguinal hernia, perirectal abscess, systemic infection, burns, etc.[8] In addition, poor hygiene or prolonged bed rest can also increase the risk.[2] The predisposing factor for the emergence of Fournier gangrene is the presence of immune deficiency. Diabetes was ranked the highest as a predisposing factor for the emergence of Fournier gangrene (60%), followed by old age, malignancy, long-term steroid use, cytotoxic drugs, lymphoproliferative disease, malnutrition and HIV.[2] This patient is 53 years old and is a diabetic patient whose sugar is not controlled and has poor hygiene.

The classification of necrotizing soft tissue infections is divided into four based on the microbiological infection.[9] The first type is the Polymicrobial type as the most common etiology (>50%). There is a synergism of anaerobic, aerobic, and facultative aerobes (*E. coli, Pseudomonas spp.,* or *Bacteroides spp*). The most preferred areas in this type are the perineum and trunk[7] The second type is the Monomicrobial type. This type includes not as much as the first type but can be more aggressive than the first type, with Toxic shock syndrome. This type usually appears in the extremities with previous trauma or surgery history. The most common types of bacteria are Group A beta-hemolytic streptococcus, *Staphylococcus aureus*.[9] This third type of infection only appears in around < 5% of cases. The germs that play a role are Vibrio species or gram-negative bacteria. The most commonly affected areas are the extremities, trunk, or perineum. This type is classified as malignant because of the high number of Multiple Organ Failures (MOF), so that <24 hours the patient can die.[9] The fourth type of etiology Fungal with the microorganisms *Candida spp* and *Zygomycetes* often occurs in immunodeficient patients after trauma which affects predilection for extremities, trunk, and perineum. In this patient, Pus culture results on August 14th 2019, showed the growth of *Escherichia coli* and *Staphylococcus aureus* bacteria so that they were polymicrobial types. The high virulence due to the presence of polymicrobial causes rapid and aggressive tissue damage.

The initial symptoms of gangrene patients are complaints of itching and discomfort in the genital area or perineum. In addition, the skin may be normal at first, erythematous, edematous, cyanosis, blistered, or gangrene. Some patients found in the hospital had edema, pain in the genital area, presence of crepitus, feculent odor, and fever > 38°C or hypothermia with systemic symptoms.[1] The patient initially felt ulcers near the buttocks due to itching in the anal canal until the buttocks were scratched and sores appeared. The patient feels the wound in the buttocks is getting swollen and painful. The wound is felt to be getting wet and there is a smelly yellow liquid in the buttocks. The wound on the patient was also obtained to the rectum so that the patient felt pain when defecating and tended to hold his stool. The patient also found a risk factor for poor hygiene, characterized by fungi that appeared in the patient's armpits and groin.

Some of the localization and symptoms of Fournier's gangrene are scrotal pain (83%), scrotal edema (61%), feculent odor (100%), leukocytosis (85.4%), crepitus (53.6%), and fever >38°C (26.8%) according to the previous study.[2] Wound care in this patient obtained pus with a fecal odor.

The diagnosis of Fournier gangrene is based on clinical symptoms, urinalysis, complete blood count, looking for etiology such as the presence of diabetes, signs of inflammation, bacteriology of the lesion fluid, urine, blood. Bacteriological examination to assist antibiotics needed for the eradication of the causative bacteria. CT scan can be used as a modality to determine the extent and depth of gangrene. CT scan can identify tissue involvement, fluid or abscess, fat, subcutaneous emphysema.[10] In this patient, CT scans and radiological examinations of the abdomen are difficult because the patient is painful and uncooperative due to the wound.

Treatment for this disorder includes adequate fluids, regulation of electrolyte balance, routine wound care, debridement of necrotic tissue, and parenteral antibiotics. Delayed wound care and debridement increase mortality and morbidity rates. Surgical debridement is a therapy that must be done immediately and is prioritized if the wound is local and extensive debridement needs to be done to remove necrotic tissue and be covered by occlusive dressing with or without negative pressure drainage.[11] Pus and tissue cultures should be performed. The patient has treated the wound 3 times with a break every 2-3 days. A cardiothoracic surgeon carried out the first and second wound treatments, and the third wound was carried out by a plastic and reconstructive surgeon.

Correction of electrolyte disturbances, hypovolemia, hypoperfusion, parenteral empiric antibiotics, oxygen and analgesia is the initial management of this disease. The clinical chemistry of this patient showed hypoalbumin, hypokalemia, hyponatremia, so the corrective therapy for hippoalbumin was administered by infusion of 20% albumin in 4 hours, correction of hypokalemia and hyponatremia using the infusion of KN2: Tutofusin: Kalbamin = 2:1:1 in 24 hours.

Several studies recommend empirical antibiotics, including gentamicin, clindamycin, and ampicillin-sulbactam/3rd-generation cephalosporin.[12,13] A previous study also suggested metronidazole as a substitute for clindamycin, other aminoglycoside groups, or fluoroquinolones as a substitute for gentamicin (an aminoglycoside).[6] Antibiotic regimens depend on the bacterial map, but most of the antibiotics used include penicillin (for streptococci), metronidazole (for anaerobes), and cephalosporin in combination with gentamicin (for gram-negative bacteria). In this patient, Pus culture on August 14th 2019, showed the growth of *Escherichia coli* and *Staphylococcus aureus*. *Escherichia coli* bacteria are sensitive to antibiotics: chloramphenicol, levofloxacin, cefotaxime, fosfomycin, aztreonam, and ertapenem meropenem, amoxicillin-clavulanate, ampicillin, amikacin, piperazine sulbactam, ampicillin-sulbactam, ceftoxanthin, ceftaxidaxim, while intermediate to cefazoline. Other germs found were *Staphylococcus aureus* with sensitive antibiotics, namely amoxiclav, chloramphenicol, ciprofloxacin, gentamicin, erythromycin, clindamycin, levofloxacin, moxifloxacin, oxacillin, quinoprisdime, tetracycline, cotrimoxazole, foscillin, while tetracycline was resistant to ampicillin.

There are some adjunct therapies, but none have *high-level evidence.* One of them is by increasing tissue oxygenation to inhibit the growth of anaerobic bacteria, such as hyperbaric oxygen therapy. The presence of skin or tissue loss due to injury and wound care requires reconstruction of flaps or grafts by plastic surgery. The prognosis of this disease can use the Fournier Gangrene Severity Index (FGSI), which includes nine parameters if the value is > 9, then the mortality prognosis reaches 75-87.5%; however, if the value is < 9 then the survival prognosis reaches 78-88%.[14,15] The nine parameters include temperature, pulse, respiratory rate, serum sodium, serum potassium, serum creatinine, hematocrit, leukocyte count, and serum bicarbonate. In this patient, the initial temperature was 38.6°C (+1), pulse 111 (+2), breaths 28 breaths per minute (+1), serum sodium 124 mmol/l (+2), potassium 3.7 mmol/l (+1), serum creatinine 0.88 (0), Hematocrit 28.8% (+2), Leukocytes 27.49x10^3/µl (+2), Serum bicarbonate was not performed (0). So the total FGSI in this patient is 10.

A poor prognosis also occurs if the source of anorectal bacteria, advanced age, diabetes, the extent and depth of gangrene (involvement of the abdominal wall and thighs), septic shock, kidney disorders, liver disorders.[16] The patient was 63 years old, had a history of diabetes with uncontrolled drugs, the extent of gangrene was quite deep and wide (35 cm x 20 cm x 25 cm), and wounds on the abdominal wall were also found 3 cm x 2 cm x 0.5 cm.). At the time of wound care, it was known that fecal odor was found in the anorectal fistula. The cause of death could be caused by sepsis, coagulopathy, DKA, kidney failure, to MOF.[12] This patient died after the 8th day of hospitalization due to septic shock.

CONCLUSION

We report the case of a 53-year-old female with T2DM with Fournier's gangrene. In this case, the patient was given the antibiotics ceftriaxone and metronidazole. Surgical management in this patient is debridement. Multi-disciplinary management of obstetrics, urology, digestive surgery, and plastic surgery is required to manage this case. The patient died during the 8th day of treatment. The patient died of suspected septic shock.

CONFLICT OF INTEREST

All authors declare there is no conflict of interest regarding the manuscript.

ETHICS CONSIDERATION

Informed consent has been obtained from the patient based on the COPE and ICMJE protocols regarding the publication ethics prior to the study being conducted.

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AUTHOR CONTRIBUTION

MC and JN were involved in concepting, designing and supervising the manuscript. MC conduct the study. MC analyses the data. All authors prepare the manuscript and agree for this final version of the manuscript to be submitted to this journal.

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