Academia Journal of Microbiology Research 9(1): 001-006, January 2020
DOI: 10.15413/ajmr.2020.10252
ISSN 2315-7771

Academia Publishing

Research Paper

Evaluation of the diagnostic profile of coronavirus disease 2019 in Fortaleza – Ceará, Brazil.

Yhasmine Delles Oliveira Garcia[1]*, Aurineide de Almeida Braga[2], Fernanda Montenegro de Carvalho Araújo[3], Anne Carolline Bezerra Perdigão[4], Juliana Correa da Costa Ribeiro[5], Regina Célia Farias Barbosa[6], AlannaPalhano Vieira[7], Isabella Araújo Duarte[8], Beatrice Araújo Duarte[9], Romélia Pinheiro Gonçalves Lemes[10], Fernando Barroso Duarte[11]

[1]Federal University of Ceará –Fortaleza (CE), Brazil.
[2]Central de Análises Clínicas (CAC) – Fortaleza (CE), Brazil.
[3]Central de Análises Clínicas (CAC) – Fortaleza (CE), Brazil.
[4]Central de Análises Clínicas (CAC) – Fortaleza (CE), Brazil.
[5]Central de Análises Clínicas (CAC) –Fortaleza (CE), Brazil.
[6]Central de Análises Clínicas (CAC) – Fortaleza (CE), Brazil.
[7]Central de Análises Clínicas (CAC) – Fortaleza (CE), Brazil.
[8]Centro Universitário Christus - Fortaleza (CE), Brazil.
[9]Centro Universitário Christus - Fortaleza (CE), Brazil.
[10]Federal Universityof Ceará – Fortaleza (CE), Brazil.
[11]Walter CantídioUniversity Hospital - Fortaleza (CE), Brazil.

*Corresponding author. Email: yhasminedellesog@gmail.com. Tel: (86)99596-6300.

Accepted 27th December, 2020

ABSTRACT

The study evaluated the clinical profile of patients seeking a diagnosis of coronavirus disease 2019 in a private laboratory in northeastern Brazil. The data were obtained in a reference laboratory in Fortaleza, Ceará during the period from April 9 to June 16, 2020, by analyzing the form. The absolute and relative frequencies were calculated and the association between the variables was performed with the chi-square using the GraphPad Prism program. the level of significance was 5%. A total of 2049 patients were analyzed, most of them female (56.56%), with an average age of 45.16±18 years, living mainly in the city of Fortaleza-Ce. 1066 exams were performed by the RT-PCR method, 695 tests by the immunochromatographic method and 282 serological tests with positive detection of SARS-CoV-2 of 42.06%. Among detected cases, 56.51% of the patients had IgG/IgM antibodies. The age group with the highest number of cases was between 30 and 39 years of age, which the main symptoms reported were headache (36.40%), cough (29.62%), weakness (29.68%), fever (27.42%). Cardiovascular diseases (13.14%) and diabetes (7.36%) are previous cited comorbitides. At the time of diagnosis 83.61% of the patients were not in medication use. From the positive cases, 45.03% of the patients had contact with a suspected case. Therefore, the diagnosis and clinical recognition of patients with COVID-19 are essential for public policy measures in view of the current situation of combating the new coronavirus.

Key words: Coronavirus, SARS-CoV-2, pandemic, diagnosis.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) originated in the city of Wuhan in China and has spread rapidly to 220 countries so far (World Health Organization, 2020). COVID-19 is caused by a new coronavirus, called Severe Acute Respiratory Syndrome CoronaVirus 2(SARS-CoV-2) belonging to the Coronaviridae family. It is an emerging human CoV that resembles previous outbreaks such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) causing a large number of deaths, with tens of thousands of confirmed cases worldwide (Jin et al., 2020; Guo et al., 2020).

SARS-CoV-2 is transmitted by respiratory droplets, contact and possibly by oro-fecal contact, in which replication initially occurs in the mucosal epithelium of the upper respiratory tract (nasal cavity and pharynx), with greater multiplication in the lower respiratory tract and in gastrointestinal mucosa. Few infections are controlled and remain asymptomatic, some patients exhibit severe respiratory symptoms, in addition to hepatic and renal impairment, involving multiple organs (Jin et al., 2020; Hindson, 2020).

Until July 12, 2020, there were 12,552,765 confirmed cases of COVID-19, with 561,617 deaths in the world. In Latin America, the first case of COVID-19 was confirmed on February 26 in São Paulo and, since then, Brazil is considered the country with the largest number of cases in Latin America with 1,864,681 registered cases and 72,100 deaths(World Health Organization, Coronavirus Disease

(COVID-19) BRAZIL, 2020;State health secretariat, Brazil, coronavírus Brasil, 2020).

Currently, in Brazil, the Northeast region has the largest number of cases (379,297), followed by the Southeast region with 377,817 cases. Among the Northeastern States, Ceará has the highest number of cases (136,785), and the highest number of deaths (6,868), with an incidence of 1497.9/100 thousand inhabitants with a mortality rate of 75.2/100 thousand inhabitants (State health secretariat,Brazil, coronavírus Brasil, 2020).

The virus's ability to spread is beyond current estimates; therefore, we detail the profile of patients affected by Covid-19 who sought care at a reference laboratory in Ceará. The results of this study are also valuable for health policies in coping with COVID-19 in Brazil.

METHODOLOGY

This study was approved by the Research Ethics Committee of the Hematology and Hemotherapy Center of Ceará-HEMOCE, with CAAE: 311998320.9.0000.8152, under the number 4.017.053. All participants received guidance about the project and signed the free and informed consent form.

This is a descriptive, qualitative, cross-sectional study in patients who sought care at a reference laboratory in Ceará for the diagnosis of the Coronavirus from April 9 to June 16, 2020. Data were collected by analyzing forms, it included sex, age, address, profession, symptoms, previous comorbidities, test (RT-PCR, rapid test or chemiluminescence), result, treatment, travel history, hospital care and previous exams.

The cases were considered confirmed for COVID-19 when they presented real-time RT-PCR results detected for SARS CoV-2 in a combined naso and oropharynx swab sample; and/or detection of IgM and/or IgG antibodies in serum samples, by the rapid immunochromatographic test or by the chemiluminescence method.

The data were described in frequency table for qualitative variables. The statistical analysis was performed using the GraphPadPrism 6 and Excell version 2016 software.

RESULTS

2049 patients were analyzed, being (56.56%) female and (43.44%) male. The ages ranged from 0 to 99 years old with an average of 45.16 ± 18. Most patients who sought care were residents of the city of Fortaleza-CE (91.50%), Aquiraz (2.58%), Eusébio (2.48%), from the interior of Ceará (3.02%) and others states (0.39%) as shown in Table 1.

Until June 16, 2020, 1066 tests were carried out using the RT-PCR method, 695 tests using the rapid immunochromatographic method (Rapid Test) and 282 serological tests by chemiluminescence technique as shown in Figure 1a. The positivity of the tests was 42.06%. 62.76% of cases were confirmed by RT-PCR, 26.57% were by rapid test and 10.67% were detected by chemiluminescence, described in Figure 1b.

The age group with the highest number of detected cases was between 30 and 39 years of age as shown in Figure 2. There were greater number of cases detected in females (501) than in males (361), however, there was no significant association between detected cases and sex ($p = 0.244$).

Regarding the production of antibodies, from 315 positive tests, 56.51% of the cases presented IgG/IgM antibodies, 27.62% exhibited IgG antibodies and 15.87% IgM antibodies.

The symptoms most commonly reported by COVID-19 infection were headache (36.40%), cough (29.62%), weakness (29.68%), fever (27.42%), diarrhea (18,05%), difficulty in breathing (11.32%), loss of smell (anosmia) and taste (ageusia) (6.17%). However, (18.83%) of the cases reported being asymptomatic.

Most patients did not have previous morbitidies (41,99%), only (28.72%) had a pre-established disease and (29.28%) had two or more comorbidities. Among the most reported comorbidities, cardiovascular diseases (13.14%), diabetes (7.36%), chronic lung diseases (2.44%), chronic neurological diseases (2.29%), renal diseases (1.51%), immunodeficiencies (0.97%), solid and hematological neoplasms (0.92%) and liverdiseases (0.58%) (table 1).

For the aspect of the recommended treatment for COVID-19, (83.61%) of the patients did not inform or were not medicated at the time of diagnosis, (4.45%) used analgesics and antipyretics, (4.00%) used azithromycin, (4.19%) vitamins, (1.60%) ivermectin, (1.27%) prednisone and (0.88%) used chloroquine/hydroxychloroquine (Table 1)

Regarding the mode of transmission, 826 detected cases (45.03%) reported having contact with a suspected case, (35.96%) do not know and (19.01%) had no contact with any suspected or confirmed case of COVID-19 (Figure 2). Most of the cases had not beeen in a health unit in the last 15 days (80.18%), and (99.02%)did not travel in the last 15 days.

From 2049 tests performed, 72.51% were looking for the first diagnosis, so they have had a previous test and 27.49% were undergoing tests to confirm or monitor the disease's evolution.

DISCUSSION

Knowledge of the number of people infected with SARS-CoV-2 is essential to combat the spread of the etiologic agent (Singhal, 2020). The state of Ceará has a population of 9,178,363 inhabitants, being the third Brazilian state with the highest number of cases in the Northeast, with 134,610 cases and 6,842 deaths by July 12, 2020(Maciel et al., 2020). The pathology and immune response against SARS-CoV-2

Table 1: Clinical and Demographic Characterisitics of the Study (n=2049).

Characteristics	Values
Age, mean (SD)	**45,16 (18,0)**
Female Sex, nº (%)	**1159 (56,56%)**
Male Sex, nº (%)	**890 (43,44%)**
Municipality, nº (%)	
Fortaleza	**1875 (91,50%)**
Aquiraz	**53 (2,58%)**
Eusébio	**51 (2,48%)**
Interior do Estado CE	**62 (3,02%)**
Outros Estados	**8 (0,39%)**
Confirmed diagnosis of COVID-19 (n=862), nº (%)	
RT-PCR	**541 (62,76%)**
RapidImmunochromatographic Test	**229 (26,57%)**
Chemiluminescence	**92 (10,67%)**
AntibodyProduction (n=315), nº (%)	
IgG/IgM	**178 (56,51%)**
IgM	**50 (15,87%)**
IgG	**87 (27,62%)**
Symptoms, nº (%)	
Headache	**746 (36,40%)**
Cough	**605 (29,62%)**
Weakness	**612 (29,68%)**
Fever	**562 (27,42%)**
Diarrhea	**370 (18,05%)**
DifficultyBreathing	**232 (11,32%)**
AnosmiaandAgeusia	**127 (6,19%)**
Asymptomatic	**386 (18,83%)**
PreviousComorbidities, nº (%)	
Cardiovascular diseases, includinghypertension	**238 (13,14%)**
Diabetes	**151 (7,36%)**
ChronicLungDiseases	**50 (2,44%)**
ChronicNeurologicalDiseases	**47 (2,29%)**
KidneyDiseases	**31 (1,51%)**
Immunodeficiencies	**20 (0,97%)**
Neoplasms	**19 (0,92%)**
LiverDiseases	**12 (0,58%)**
Treatment	
Azithromycin	**82 (4,00%)**
Analgesicsandantipyretics	**91 (4,45%)**
Invermectin	**33 (1,60%)**
Prednisone	**26 (1,27%)**
Vitamins	**86(4,19%)**
Chloroquine/Hydroxychloroquine	**18 (0,88%)**
Withouttreatment	**1713(83,61%)**

Table 1: Contd.

Riskexposure (n=862), nº (%)	
Yes	**389 (45,03%)**
Don'tknow	**309 (35,96%)**
No	**164 (19,01%)**
TravelHistory	
Yes	**20 (0,97%)**
No	**2029 (99,02%)**

Abbreviation: COVID-19, coronavírus disease 2019; SD: standard deviation; CE- Ceará.

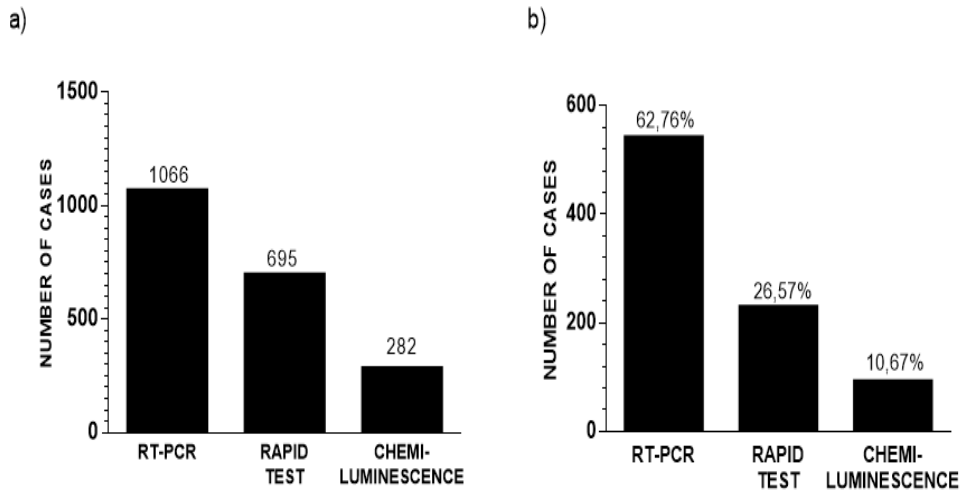

Figure 1: Tests performed at the reference laboratory in Ceará, Fortaleza, Brazil.
Note: a) Tests performed to diagnose coronavirus in 2049 patientes. b) Frequency of detection by tests used. Abreviação: RT-PCR, Reverse Transcription followed by Polymerase Chain Reaction.

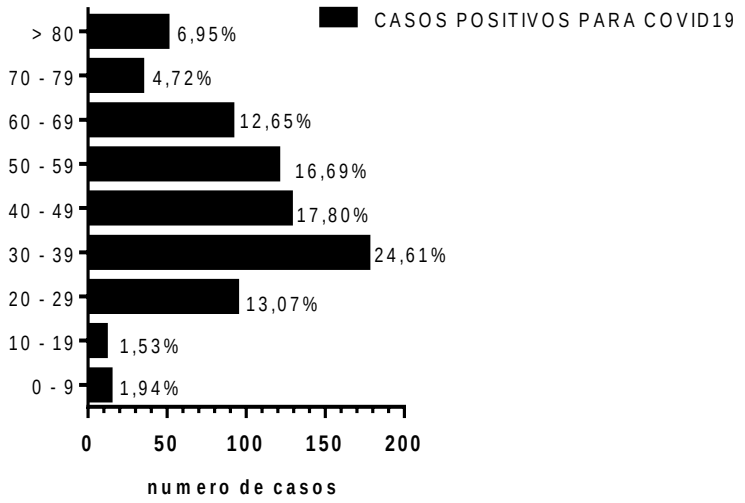

Figure 2: Distribution of the range between patients confirmed for COVID19.
Abreviation: COVID-19.

infection is believed to be influenced by several factors, including sex, age, viral load, underlying health problems and genetic factors (Scully et al., 2020). The interactions between these factors may be implicated in a greater vulnerability to infection with this coronavirus. Knowing the profile of patients infected with SARS-CoV-2 paves the way for analyzes that indicate the behavior of COVID-19 in the state of Ceará.

In the case of COVID-19, the literature covers several studies that make it possible to understand the clinical and laboratory profile of patients and the transmission dynamics in order to mitigate the transmission of Covid-19 (Singhal, 2020; Wiersinga et al., 2020).

COVID-19 affects both sexes, studies with the Chinese population showed that hospitalizations and deaths were higher among men than among women (Park, 2020). In the United States, diagnostic rates were similar for both sexes (Scully et al., 2020). In Ceará, the incidence in males is higher than in females, especially among the age groups (30-39 years) and (50 - 69 years) (Ministry of health, 2020).

Advanced age is one of the most recognized mortality risk factors in COVID-19 (Singhal, 2020). Adults over 65 years represent 80% of hospitalizations and have a risk of death 23 times higher than those <65 years (Mueller et al., 2020). Individuals with COVID-19 under the age of 18 represent 2% to 5% of cases and generally have milder symptoms, limited to the upper respiratory tract and rarely require hospitalization (Wiersinga et al., 2020).

In the present study, the age group with the highest number of cases was between 30-39 years, corroborating the study by Sousa (2020) where confirmed and reported cases in Brazil, showed a higher proportion in the age group (20-29 and 30-39 years) (Souza and Buss, 2020).

The diagnosis of COVID-19 is made through the polymerase chain reaction test via nasal swab (RT-PCR), the current gold standard for RNA detection of SARS-CoV-2. Clinical, laboratory and image findings can also be used to establish a presumptive diagnosis of the disease (Wiersinga et al., 2020). The antibody detection tests against SARS-CoV-2, (rapid immunochromatographic test) is intended to qualitatively detect IgG and IgM antibodies against SARS-CoV-2 in human serum, plasma and whole blood. Thus, complementary to RT-PCR, essential to obtain a more accurate estimate of the total number of infections in a population and to what extent they must be immuned to a future virus infection.

In Ceará, the number of positive tests for COVID-19 was 27,812 (Ministry of health, 2020). According to the present study, most of the tests were RT-PCR, followed by the rapid test and serology, corresponding to the initial phase of the pandemic in Ceará, where patients sought viral detection (Figure 1 a - b). Regarding the rapid test, 70.85% of the confirmed patients had IgG / IgM antibodies, 17.94% exhibited only IgM antibodies and 11.21% IgG antibodies, reflecting the seroconversion period of most detected patients (Table 1). However, there was no association between the detected cases and sex ($p = 0.1667$).

The SARS-CoV-2 virus targets the cells lining the respiratory epithelium, causing a series of symptoms from asymptomatic infection to severe lung disease that requires mechanical ventilation (Subbarao and Mahanty, 2020). Patients with COVID-19 usually have fever, dry cough, headache, dyspnea, myalgia, and may progress to acute respiratory distress syndrome, pulmonary consolidation, cytokine release syndrome, endothelitis, coagulopathy, multiple organ failure and death (Rodriguez-Morales et al., 2020). More recently, anosmia, hyposmia and dysgeusia have also been described as widely characteristic during the initial phase of COVID-19. The symptoms reported by patients in the present study corroborate the findings of Pericas et al., 2020 (Pericàs et al., 2020) (Table 1).

Approximately 60 to 90% of patients requiring hospitalization have some type of previous comorbidity (Wiersinga et al., 2020). Among comorbidities, cardiovascular diseases including, hypertension, diabetes, chronic lung disease, chronic kidney disease, neoplasms and liver diseases are found in patients with a worse prognosis, however, these comorbidities may be correlated with advanced age (Pericàs et al., 2020). Cardiovascular diseases were the most reported comorbidities in the present study (Table 1)

Currently, some classes of drugs such as antivirals, antibodies, anti-inflammatories, immunomodulators, anticoagulants and antifibrotics are being used in the treatment of COVID-19, with efficacy depending on the manifestation and stage of the disease (Wiersinga et al., 2020). Hydroxychloroquine alone or combined with azithromycin, lopinavir/ritonavir and remdesivir have been the most used drugs at the moment. However, hydroxychloroquine and chloroquine alone or combined with azithromycin can increase hospital mortality and the risk of ventricular arrhythmia (Mehra et al., 2020). In Brazil, the protocol used in hospitals consists of: chloroquine or hydroxychloroquine with occasional association with azithromycin for patients with signs of severity and laboratory evidence of "cytokine storm", the use of anticoagulants with corticosteroids is considered (Ministerio da Saúde, 2020). Table 1 reflects the treatments reported during the research. Azithromycin being the most used drug alone or in combination with dipyrone, chloroquine / hydroxychloroquine and ivermectin (Pericàs et al., 2020).

SARS-CoV-2 is highly transmissible, even by asymptomatic and pre-symptomatic infected people, which makes its spread very difficult to control (Rabi et al., 2019). About 45% of the detected cases stated that they had contact with a suspected or confirmed case of COVID-19, in which, the majority did not attend a health unit in the last 15 days before the test, that is, the infection occurred outside the hospital environment.

CONCLUSION

The analyses of the showed that between April and June, the positivity of the covid-19 diagnosis was 42.06%, detected mainly by the RT-PCR method, with an age range between 30 and 39 years with the highest number of cases. Therefore, the present study is important to know the

profile of patients affected by Covid-19 in Ceará, and can assist in epidemiological surveillance measures in the state, in addition to providing data for future studies.

REFERENCES

Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, Jin HJ, Tan KS, Wang DY Yan Y (2020). The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. Mil. Med. Res. 7(1): 11.

Hindson J (2020). COVID-19: faecal–oral transmission? Nat. Rev. Gastroenterol. Hepatol. 17(5): 259.

Jin Y, Yang H, Ji W, Wu W, Chen S, Zhang W, Duan G (2020). Virology, Epidemiology, Pathogenesis, and Control of COVID-19. Viruses. 12(4): 372.

Maciel JAC, Castro-Silva II, Farias MR (2020). Análise inicial da correlação espacial entre a incidência de COVID-19 e o desenvolvimento humano nos municípios do estado do Ceará no Brasil. Rev. Bras. Epidemiol. 23: e200057.

Mehra MR, Desai SS, Ruschitzka F, Patel AN (2020). Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis. Lancet. 20: 31180-31186.

Ministerio da Saúde (2020). BOLETIM EPIDEMIOLÓGICO ESPECIAL. Doença pelo Coronavírus COVID-19. Semana Epidemiológica 27 (28/06 a 04/07).

Mueller AL, McNamara MS, Sinclair DA (2020). Why does COVID-19 disproportionately affect older people. Aging (Albany NY). 12(10): 9959-9981.

Park SE (2020). Epidemiology, virology, and clinical features of severe acute respiratory syndrome - coronavirus-2 (SARS-CoV-2; Coronavirus Disease-19). Clin. Exp. Pediatr. 63(4): 119-124.

Pericàs JM, Hernandez-Meneses M, Sheahan TP, Quintana E, Ambrosioni J, Sandoval, Falces C, Marcos MA, Tuset M, Vilella A, et al (2020). COVID-19: from epidemiology to treatment. Eur. Heart J. 41(22): 2092-2112.

Rabi FA, Al Zoubi MS, Kasasbeh GA, Salameh DM, Al Nasser AD (2020). SARS-CoV-2 and Coronavirus Disease 2019: What We Know So Far. Pathogens. 9(3): 231.

Rodriguez-Morales AJ, Cardona-Ospina JA, Gutierrez-Ocampo E et al (2020). Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. Travel Med. Infect. Dis. 34: 101623.

Scully EP, Haverfield J, Ursin RL, Tannenbaum C, Klein SL (2020). Considering how biological sex impacts immune responses and COVID-19 outcomes. Nat. Rev. Immunol. 20: 442-447.

Secretarias Estaduais de Saúde. Brasil, coronavírus Brasil, 2020.[cited 2020 jun 23]. Available from: https://covid.saude.gov.br/.

Singhal T (2020). Review of Coronavirus Disease-2019 (COVID-19). Indian J. Pediatr. 87: 281–286.

Souza WM, Buss LF, Candido DDA et al (2020). Epidemiological and clinical characteristics of the early phase of the COVID-19 epidemic in Brazil. https://doi.org/10.1101/2020.04.25.20077396.

Subbarao K, Mahanty S (2020). Respiratory Virus Infections: Understanding COVID-19. Immunity. 52(6): 905-909.

Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC (2020). Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. JAMA. 324(8): 782-793.

World Health Organization, Coronavirus Disease (COVID-19) BRAZIL.[cited 2020 jun 23]. Available from: https://covid19.who.int/region/amro/country/br.

World Health Organization, Coronavirus Disease (COVID-19). Dashboard. [cited 2020 jun 23]. Available from: https://covid19.who.int/.

Cite this article as:

Garcia YDO, Braga AdA, Araujo FMdC, Perdigao ACB, Ribeiro JCdC, Barbosa RCF, Vieira AP, Duarte IA, Duarte BA, Lemes RPG, Duarte FB (2021). Evaluation of the diagnostic profile of coronavirus disease 2019 in Fortaleza – Ceará, Brazil. Acad. J. Microbiol. Res. 9(1): 001-006.

Submit your manuscript at
http://www.academiapublishing.org/ajmr