International Medical Society
http://imedicalsociety.org

International Archives of Medicine
Section: Infectious Diseases
ISSN: 1755-7682

2016
Vol. 9 No. 338
doi: 10.3823/2209

Quality of Life of Patients with Intestinal Parasites Assessed Through a Logistic Regression Model

ORIGINAL

Ulanna Maria Bastos Cavalcante[1], Silvia Adelaide Linhares de Melo[2], Iasmin Freitas Pimentel Pequeno[3], Ana Carolina da Silva Monteiro[4], Hemílio Fernandes Campos Coelho[5], Francisca Inês de Sousa Freitas[6], Caliandra Maria Bezerra Luna Lima[7]

1 Enfermeira, Mestre em Modelos de Decisão e Saúde pela Universidade Federal da Paraíba, *.
2 Farmacêutica, Mestre em Modelos de Decisão e Saúde pela Universidade Federal da Paraíba, *.
3 Cirurgiã-dentista pela Universidade Federal da Paraíba, Pós-graduanda em cirurgia oral pelo COESP-PB, *.
4 Biomédica, Mestranda em Modelos de Decisão e Saúde pela Universidade Federal da Paraíba *.
5 Estatístico, Doutor em Estatística pela Universidade Federal de Pernambuco, Professor Adjunto II da Universidade Federal da Paraíba, Professor no Programa de Pós-graduação em Modelos de Decisão e Saúde da Universidade Federal da Paraíba, *.
6 Farmacêutica, Doutora em Ciências da Saúde pela Universidade Federal da Paraíba, Professora na Universidade Federal da Paraíba, *.
7 Farmacêutica, Doutora em Produtos Naturais e Sintéticos Bioativos pela Universidade Federal da Paraíba, Professora de Parasitologia da Universidade Federal da Paraíba, *

*: João Pessoa-PB, Brazil

Contact information:

Ulanna Maria Bastos Cavalcante

Address: Rua Vitalina Cavalcante dos Santos, 92, Centro, 58940-000, São José de Piranhas-PB, Brazil.

ulannacavalcante@hotmail.com

Abstract

Introduction: The agents that cause intestinal parasitic diseases are protozoa and helminthes, through the involvement of the intestine of living beings. The concern about such diseases arises from the consequences caused in man, after installed in the body, and the symptoms they cause, such as nausea and vomiting. It is noteworthy that the intestinal parasitic diseases are among the neglected diseases in Brazil.

Objective: To evaluate the quality of life of patients with intestinal parasites treated at a Public Service, applying a Logistic Regression Model.

Method: This is an observational, analytical study, with cross-sectional design. Data were collected in the laboratory of the service. The sample consisted of 135 patients, aged 18-59 years, who had request for stool analysis. Their invitation occurred through an individual approach and, then, they received the Quality of Life Questionnaire SF-36.

Results: The sample consisted of 135 patients: 80 had diagnosis of some intestinal parasitic disease - 56 had the pathogenic form and 24, intestinal commensals. Statistical analysis revealed that, among the studied variables, the type of animal; marital status; constipation; functional capacity domain; pain domain; mental health domain; vomiting and abdominal colic, provided evidence about which associates with the presence or absence of intestinal parasites, making the first final model.

© Under License of Creative Commons Attribution 3.0 License

Conclusion: Based on those results, the selected models can be used as a reference to assess the quality of life of patients with intestinal parasites treated at a Public Service.

Keywords
Quality of Life; Regression Analysis; Parasitic diseases; Health Promotion.

Introduction

The agents that cause intestinal parasitic diseases are protozoa and helminthes, through the involvement of the intestine of living beings. They cause the commitment of thousands of individuals, who become unable to achieve their production potential, as they do not have the minimum health conditions [1]. Concern about such diseases arises from the consequences caused in man, after installed in the body, and symptoms they cause, such as nausea and vomiting, the main causes of death in children. It is noteworthy that the intestinal parasites are among the neglected diseases in Brazil. Neglected diseases (ND) are the set of diseases caused by infectious and parasitic agents that produce important physical, cognitive and socioeconomic damage in children and adolescents, especially in low-income communities [2]. Furthermore, these diseases because they affect low-income people, have reduced investments in research, production of medicines and yet in control. For public health, they become a challenge, particularly those who come to impact on morbidity profile [3].

Although there are effective treatments for helminthic and protozoan infections, it appears that access to treatment is not always available to the public in endemic areas [4]. Among the intestinal protozoa responsible for important diseases in public health worldwide and in Brazil, there are: *Entamoeba hystolitica* [5, 6] and *Giardia lamblia* [7-9]. The prevalence of those parasites occurs in all tropical developing nations, and there is an estimation they cause over 100,000 deaths annually [10].

Moreover, even if there is success in drug therapy, the individual's exposure to environmental factors may favor the reinfection process [11, 12]. Given the above, the understanding of the health status of residents of endemic areas is not compatible with the concept of health status of areas with developed economy, such as Europe, Japan and North America. Thus, there are limitations on the use of standards of health measures used in developing countries [4].

In this study, the chosen decision rule, which will serve to establish evidence on which variables are relevant for intestinal parasites in patients treated at the laboratory of a hospital school, will base on a Logistic Regression Model (LRM). It is necessary to emphasize that there is no knowledge in the research literature using this statistical technique specifically to investigate such occurrence. The choice of this location was given for being a reference hospital in the city and receive many low-income patients for care.

The LRM is able to establish a dependency relationship between a single response-variable, denoted by Y, of binary nature (that is, its value 0 is for the absence of certain condition/characteristic, and its value 1 is for the presence of that condition/characteristic) and a set of independent variables assisting in decision-making given the outcomes based on the calculation of the probability of occurrence of the value 1, that is, the model is able to establish

the probability that certain condition/characteristic is present in an individual based on a set of explanatory variables available for study.

This type of statistical model is increasingly becoming one of the main statistical methods of data modeling in many fields of knowledge. In recent decades, as a result of scientific theoretical advances and the optimization of computational processing and development of statistical packages, the regression models showed considerable applicability and development [13]. In this way, the study sought to evaluate the quality of life of patients with intestinal parasites treated at a Public Service, applying a Logistic Regression Model.

Methods

This is an observational, analytical study, with a cross-sectional design. The survey took place at the Laboratory of Clinical Analysis of the University Hospital Lauro Wanderley (HULW), the period predetermined November 2014 to June 2015. The study included 135 patients aged 18-59 years who underwent parasitological stool analysis by techniques adopted by the Hospital, as established in the daily routine of the laboratory, and who agreed to participate in the study by signing the Informed Consent Form. The exclusion criterion was patients using anxiolytics or antidepressants. Data were daily collected, in the morning shift at the Hospital laboratory, by two researchers. There was invitation of patients with request for stool analysis through an individual approach.

Participants received a questionnaire to answer, the Medical Outcomes Study 36-Item Short-Form Health Survey (or Quality of Life Questionnaire SF-36), which investigated aspects related to their quality of life. It consists of 36 items of self-response (intended to assess health concepts that represent basic human values relevant to functionality and well-being of each person), divided into eight domains (Functional Capacity, Limitation by Physical Aspects, Pain, General Health, Vitality, Social Aspects, Emotional Aspects and Mental Health), each with its own character. The values of each field vary from 0 to 100, where 0 indicates the worst state of the domain and 100 indicates the best state of the domain.

In the context of this study, the Quality of Life (QOL) is understood as subjective quality of life or quality of life perceived by the people, influenced mostly by the World Health Organization (WHO) states that health is not restricted to the absence disease, but encompasses the individual perception of complete physical, mental and social well-being.

The laboratory provided the result of the stool analysis, considered infected patients who were positive for eggs or larvae of helminthes, cysts or trophozoites of protozoa. Exploratory data analysis and the application of the LRM were performed using R version 3.1.0 software, which is available for free at the following address: www.r-project.org. Regarding ethical principles, the project was approved by the Research Ethics Committee of HULW, according to Resolution 466/2012 of CNS/MS regulating the ethics of research involving human beings (Process No. 854700/2014).

Results

The results initially divided in the exploratory data analysis, useful for the calculation of descriptive measures, with the characterization of the population studied in the UH's Laboratory of Clinical Analysis in the city of João Pessoa/PB, followed by an analysis by Logistic Regression, for definition.

The sample consisted of 135 patients: 80 with diagnosis of some intestinal parasite, 56 classified as pathogenic and 24 as intestinal commensals. Some of the species of parasites were *Ascaris lumbricoides* (28.75%), followed by *Giardia lamblia* (25.0%), *Endolimax nana* (18.75%) and *Entamoeba coli* (12.5%). Most positive cases were single-

© Under License of Creative Commons Attribution 3.0 License

parasitic infection (92.5%). **Table 1** shows the distribution of the surveyed individuals according to the type of parasite and parasitic association of the stool analysis samples.

Table 1. Parasite type and parasitic association of positive samples of the stool analysis for intestinal parasites and commensals of patients (n = 80), at the Laboratory of Clinical Analysis of the UHLW, João Pessoa-PB, 2015.

Positive Stool Analysis	Frequency	
	n	%
Ascaris lumbricoides	23	28.75
Giardia lamblia	20	25.0
Endolimax nana	15	18.75
Entamoeba coli	10	12.5
Iodamoeba butschlii	3	3.75
Entamoeba histolytica/Entamoeba dispar	3	3.75
Strongyloides stercoralis	2	2.5
Ancilostomídeos	2	2.5
Schistosoma mansoni	1	1.25
Trichuris trichiura	1	1.25
Parasitic Associations		
Single-parasite	74	92.5
Two parasites	2	2.5
Multiple parasites	4	5.0
Total	80	100

Source: Research data, 2015.

This study used the LRM to provide evidence on which variables associate with the presence or absence of intestinal parasites, which could come to compose the final model. Two Logistic Regression Models were adjusted. In the selection of the first model, with all 135 respondents, the response variable occurs as follows: 1, if the individual has parasites, and 0, if the individual has no parasites. In the second model, only with the positive patients, the response variable was the presence or absence of pathogenic parasite. Initially, after adjusting the LRM, the variables whose p-value of the adjusted coefficients estimations were lower than 10% were considered significant ($\alpha = 0.10$).

After applying the stepwise method, used for selecting variables in a statistical model, the final model selected eight of the 106 initial variables, as follows: type of animal, marital status (excluded for not being relevant for the occurrence of parasitic diseases), constipation, functional capacity domain, pain domain, mental health domain, vomits and abdominal colic. It is noteworthy that some variables had their levels grouped in an attempt to identify whether there was indeed significant for the model, since, without grouping, variables considered relevant to the model would be out. In this case, there was the type of animal variable, in which levels 2 and 4 were significant for the model: level 2 for those who have a cat as pet and 4 for those who own cat and dog. **Table 2** shows the final model, highlighting the variables important to the study.

Table 2. Variables resulting from the final logistic model for all interviewees (n=135), João Pessoa-PB, 2015.

Variable	Estimated Parameters	Standard Error	P-value
Intercept	1.921348	0.983776	0.05082
Type of animal (cat)	1.975597	0.860883	0.02174
Type of animal (cat and dog)	-2.826041	1.133768	0.01268
Constipation	-2.441383	0.877671	0.00541
Functional capacity domain	0.021926	0.009538	0.02151
Pain domain	-0.021459	0.010637	0.04365
Mental health domain	-0.030674	0.012715	0.01585
Vomits	1.663667	0.826174	0.04404
Abdominal colic	1.101228	0.609358	0.07073

Source: Research data, 2015.

Then, there was the calculation of the Odds Ration of LRM Variables in relation to the outcome of this study, which obtained the disclosed results **(Table 3)**

Table 3. Odds ratio estimates corresponding to the variables of all respondents (n=135), João Pessoa-PB, 2015

Variables	OR	CI (95%)
Type of animal (cat)	7.2	1.33-38.97
Type of animal (cat and dog)	0.05	0.006-0.54
Constipation	0.08	0.01-0.48
Functional capacity domain	1.02	1.0-1.04
Pain domain	0.97	0.95-0.99
Mental health domain	0.96	0.94-0.99
Vomits	5.2	1.04-26.65
Abdominal colic	3.0	0.91-9.92

Source: Research data, 2015..

With the model, it is necessary to test its validity. In order to evaluate the model, one used the Nagelkerke R2 statistics, Hosmer-Lemeshow test and the deviation function or Deviance. Nagelkerke R2 allows assessing whether the model improves, or not, the quality of the predictions. In this model, the independent variables explained 47.6% of variability of the response variable. Therefore, there is evidence that the model is well adjusted to the data, at the significance level of 5%. With this, we cannot reject the null hypothesis that the observed values do not differ significantly from the values predicted by the model. The obtained deviation function (123.6) was less than the chi-square (149.8), which also validates the model.

Thus, after applying the LRM in the whole database, that is, in all 135 respondents, a regression was performed only on the sample consisting of 80 patients with positive results, being the response variable the presence or absence of pathogenic parasites. The final model selected eight of the 106 initial variables, as follows: decreased work/activities, comorbidity, abdominal colic, moderate activities, physical aspect domain, vomits, basic sanitation and animal type. **Table 4** shows the final model.

Next, there was the calculation of the Odds Ration of the LMR Variables in relation to this outcome, which showed the following results **(Table 5)**

Table 4. Variáveis resultantes do modelo logístico final para pacientes positivos (n=80), João Pessoa-PB, 2015.

Variable	Estimated Parameters	Standard Error	P-value
Intercept	2.57635	1.05880	0.01496
Decreased work/ activities	-1.99854	1.06262	0.06000
Comorbidity	-2.37645	1.01932	0.01973
Abdominal colic	-1.51843	0.79295	0.05550
Moderate activities	2.64129	0.93210	0.00460
Physical aspect domain	-0.02119	0.00947	0.02526
Vomits	1.90743	1.10721	0.08494
Basic sanitation	-1.72864	0.82555	0.03627
Type of animal	2.12041	0.80273	0.00825

Source: Research data, 2015.

Table 5. Odds ration estimates corresponding to the variables of positive patients (n=80), João Pessoa-PB, 2015.

Variables	OR	CI (95%)
Decreased work/activities	0.13	0.01-1.08
Comorbidity	0.09	0.01-0.68
Abdominal colic	0.21	0.04-1.03
Moderate activities	14.03	2.25-87.19
Physical aspect domain	0.97	0.96-0.99
Vomits	6.73	0.76-58.99
Basic sanitation	0.17	0.03-0.89
Type of animal	8.33	1.72-40.19

Source: Research data, 2015..

Again, with the defined model, its validity was tested. In order to evaluate the model, one used the Nagelkerke R2 statistics, obtaining 0.4316172, the deviation function or Deviance, with 68.6 and chi-square, 85.5. In this second model, the independent variables explained 43.1% of variability of the response variable. One may also consider that there is evidence that the model is well adjusted to the data, at the significance level of 5%. With this, we cannot reject the null hypothesis that the

© Under License of Creative Commons Attribution 3.0 License

observed values do not differ significantly from the values predicted by the model. The obtained deviation function was less than the chi-square, which also validates this model.

Discussion

Through this study, it was possible to identify the statistically significant variables that can affect the quality of life of patients with intestinal parasites. Thus, the final logistic models presented enabled a better understanding of the studied problem.

In Brazil, the parasites *Entamoeba coli*, *Trichuris trichiura*, Ascaris lumbricoides, Hookworm, *Endolimax nana* and *Entamoeba hystolitica/Entamoeba dispar* are the most frequent [14]. A study conducted at the University Hospital Lauro Wanderley, in the city of João Pessoa, observed that Hookworms and *Ascaris lumbricoides* are the most prevalent. Regarding the parasitic associations, parasitological analysis was positive in 17 (50%) of the samples, of which 15 (86.6%) were single-parasitic infections and two (13.4%), infections with two parasites. There was no record of infections with multiple parasites [15].

Regarding the variables chosen by the first model, one observes that they have a strong relationship with the outcome "analysis results", estimating the likelihood of individuals having parasites according to the information obtained in this model. Of the 135 patients interviewed, 80 had diagnosis of some intestinal parasitic infection, which corresponds to 59.25% of the total sample. Among the variables presented in this model, it is noteworthy the mental health domain, which presents as a protective factor.

Several authors have reported that people with mental disorders, particularly in the acute exacerbation period, present psychomotor disturbances, perversion of eating habits, apathy, attention deficit, impairment of thought, among others, linked to side effects caused by some drugs used in their treatment, strongly collaborating to changes in physiological and behavioral normal activities, lacking special care by all those who relate to them [16-18].

Through the values presented in the odds ratio estimates corresponding to all respondents variables (n=135), at confidence level of 95%, one observed that individuals who have a cat as pet have 7.2 times the chance of developing parasitic infections, more than 5.2 of presenting vomits in the last six months, 3.0 times of having abdominal colic, followed by the functional capacity domain, with 1.02 chances of developing an intestinal parasitic infection. As for individuals who own cat and dog, who have constipation and who fit in the pain and mental health domains, those chances of occurrence reduce.

There is evidence that the presence of cats at home greatly increases the chances of an intestinal parasitic infection. Accordingly, according to Balassiano et al. (2009) [19], domestic cats are considered important reservoirs of intestinal parasites, which ultimately contaminate public places frequented by both children and adults, exposing man to a greater risk of infection, as well as other domestic animals.

The functional capacity domain relates to activities that a person can do during a typical day, that is, routine tasks. Although the mortality rate caused by intestinal parasites is considerably low, many cases require hospital care for complications, such as malabsorption, diarrhea and decreased ability to work, meaning an important health and social problem [20, 21], since they interfere directly or indirectly in the performance of daily activities of human life.

In the model presented in **Table 4**, and the one shown in **Table 2**, it was also possible to obtain variables that relate to the outcome, which, in this case, corresponds to the presence or absence of pathogenic parasites. One emphasizes the moderate activities variable, part of the functional capacity

This article is available at: www.intarchmed.com and www.medbrary.com

domain of the SF-36 questionnaire. That domain relates to the performance of daily activities of individuals, and as the literature shows, parasitic diseases are also responsible for the deficiency in learning and physical development and may cause functional disability [22-25].

In the estimates of odds ratio corresponding to the variable positive patients (n=80), subjects with moderate activities increase over 14.03 times the chance of developing an intestinal parasitic infection, and the presence of any animal at home increases by 8.33 that chance. The symptom vomits in the last six months increased by more than 6.73 the chance of having such diseases. Other variables, such as decreased work/activities, comorbidity, abdominal colic, physical aspect domain and basic sanitation have those chances of occurrence reduced.

Conclusion

Based on those results, the selected models can be used as a reference to assess the quality of life of patients with intestinal parasites treated at the UHLW laboratory located in João Pessoa - PB. The Logistic Regression arises in the study as a method that generated a better understanding of the studied problem, identifying, within the socioeconomic factors and quality of life domains, which variables are significant in the preparation of the final model, acting as factors of risk for the presence of intestinal parasites, observed in most individuals in the sample.

Thus, this research, unprecedented in the city of João Pessoa, contributes to a better understanding of the problem in question, besides providing important data for planning actions for the prevention and control of intestinal parasites. The presence of these is related to environmental factors, contact with animals, hygiene of food consumed, lack of basic sanitation, among others. Besides that, it also opens room for further studies, which may also be developed in other populations, like the patients treated in Basic Health Units (BHU), since those patients are also exposed to factors that lead to involvement by those parasites.

Conflicts of interest

The authors state they do not have any conflict of interest.

References

1. Andrade EC, Leite ICG, Vieira MT, et al. Prevalência de parasitoses intestinais em comunidade quilombola no Município de Bias Fortes, Estado de Minas Gerais, Brasil, 2008. Epidemiol. Serv. Saúde, Brasília, set. 2011; 20(3):337-344.
2. Mathers CD, Gore FM, Patton GC, et al. Global burden of disease in young people aged 10-24 years: authors' reply. Lancet, jan 2012; 379(9810):28.
3. Hotez PJ. Neglected infections of poverty in the United States of America. PLoS Negl Trop Dis.,2008; 2(6):e256.
4. King CH. Health metrics for helminth infections. Acta Tropica, 2015; 141:150-160.
5. De Assis EM, Oliveira RC, Moreira LE, et al. Prevalência de parasitos intestinais na comunidade indígena Maxakali, Minas Gerais, Brasil, 2009. Cad. Saúde Pública, 2013; 29(4):681-690.
6. Hegazi MA, Patel TA, El-Deek BS. Prevalence and characters of Entamoeba histolytica infection in Saudi infants and children admitted with diarrhea at 2 main hospitals at South Jeddah: a re-emerging serious infection with unusual presentation. Braz. J. Infect. Dis., 2013; 17(1):32-40.
7. Domínguez-López ME, González-Molero I, Ramírez-Plaza CP, et al. Chonic diarrhea and malabsorption due to common variable immunodeficiency, gastrectomy and giardiasis infection: a difficult nutritional management. Nutr. Hosp., 2011; 26(4):922-925.
8. Gonçalves ALR, Belizário TL, Pimentel JB, et al. Prevalence of intestinal parasites in preschool children en the region of Uberlândia, State of Minas Gerais, Brazil. Rev Soc. Bras. Med., 2011; 44(2):191-193.
9. Cañete R, Diaz MM, García RA, et al. Intestinal parasites in children from a day care centre in Matanzas City, Cuba. PLoS One., 2012; 7(12):e51394.
10. Saldanha RR, Silva CA, Santos AA, et al. Infecção parasitária em escolares da cidade de Ceilândia, Brasília, Distrito Federal. Ensaios Cienc., Cienc. Biol. Agrar. Saúde, 2014; 18(1):37-45.
11. Jia TW, Melville S, Utzinger J, et al. Soil-transmitted helminth reinfection after drug treatment: a systematic review and meta-analysis. PLoS Negl. Trop. Dis., 2012; 6(5):e1621.

© Under License of Creative Commons Attribution 3.0 License

12. Satayathum SA. Factors affecting infection or reinfection with Schistosoma haematobium in coastal Kenya: survival analysis during a nine-year, school-based treatment program. Am. J. Trop. Med. Hyg., 2006; 75:83-92.
13. Barreto AS. Modelos de Regressão: Teorias e Aplicações com o Programa Estatístico R. 1ª Ed. Brasília: Ed. do Autor, 2011.
14. Silva MTN. Associação entre escolaridade materna e prevalência e intensidade de infecção por Ascaris lumbricoides, em Campina Grande, Paraíba. Revista Saúde & ciência UFCG (CCBS/UFCG). [Internet]. 2010 [cited 2015 Nov 10]; 1(1):37-41. Available from: http://150.165.111.246/revistasaudeeciencia/index.php/RSC-UFCG/article/view/25/28
15. Melo SAL de, Cavalcante UMB, Dantas SH et al. Perfil dos pacientes e os fatores relacionados à enteroparasitoses. Rev enferm UFPE on line., Recife, ago. 2016; 10(8):2809-17.
16. Lee J, Park GM, Lee DH, et al. Intestinal parasites infections at an institution for the handicapped in Korea. Korean J Parasitol., 2000; 38(3):72-80¬.
17. Giacometti A, Cirioni O, Baducci M, et al. Epidemiologic features of intestinal parasitic infections in Italian mental institutions. Eur J Epidemiol, 1997; 13:825-830.
18. Gatti S, Lopes R, Cevini C, et al. International parasitic infections in institution for the mentally retarded. Ann Trop Med Parasitol, 2005; 94:453-460.
19. Balassiano BC, Campos MR, Menezes R de C, et al. Factors associated with gastrointestinal parasite infection in dogs in Rio de Janeiro, Brazil. Preventive Veterinary Medicine, 2009; 91(2-4):234-240.
20. Melo MCB, Klem VGQ, Mota JAC, et al. Parasitoses intestinais. Rev Med Minas Gerais, 2004; 14(Supl. 1):S3-S12.
21. Vasconcelos IAB, Oiveira JW, Cabral FRF, et al. Prevalência de parasitoses intestinais entre crianças de 4-12 anos no Crato, Estado do Ceará: um problema recorrente de saúde pública. Acta Scientiarum. Health Sciences, Maringá, 2011; 33(1):35-41.
22. Ferreira GR, Andrade CFS. Alguns aspectos socioeconômicos relacionados a parasitoses intestinais e avaliação de uma intervenção educativa em escolares de Estiva Gerbi, SP. Rev Soc Bras Med Trop, 2005; 38, p. 402 -405, 2005.
23. Neves DP. Parasitologia Humana. 12ª ed. Rio de Janeiro: Atheneu, 2011.
24. Chaves ÉMS, Vazquez L, Lopes J, et al. Levantamento de Protozoonoses e Verminoses nas sete creches municipais de Uruguaiana, Rio Grande do Sul – Brasil. RBAC, 2006; 38:39-41.
25. Addum FM, Serra CG, Sessa KS, et al. Planejamento local, Saúde Ambiental e Estratégia Saúde da Família: uma análise do uso de ferramentas de gestão para a redução do risco de contaminação por enteroparasitoses no município de Venda Nova do Imigrante. Physis, 2011; 21:955-978.

Publish in International Archives of Medicine

International Archives of Medicine is an open access journal publishing articles encompassing all aspects of medical science and clinical practice. IAM is considered a megajournal with independent sections on all areas of medicine. IAM is a really international journal with authors and board members from all around the world. The journal is widely indexed and classified Q2 in category Medicine.