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Epidemiology of the Diverticular Disease - Systematic Review of the Literature

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Rezumat

Epidemiologia bolii diverticulare colonice - review sistematic al literaturii

Introducere: Asociată dietei și stilului de viață occidental, boala diverticulară afectează tot mai pregnant țări în curs de dezvoltare de pe întreg mapamondul. Studii recente arată o creștere a incidenței bolii la vârstele tinere, fapt ce crește riscul apariției complicațiilor, cu implicații majore atât la nivel individual dar și asupra sistemului medical.

Metodă: Review-ul sistematic al literaturii de specialitate cu ajutorul US National Library of Medicine și National Institutes of Health International PubMed Medline, utilizând rezumate și articole disponibile în bazele de date PubMed Medline, Cochrane și Google Scholar. Cautarea în bazele de date după cuvintele cheie ("Diverticulosis, Colonic/epidemiology" [MeSH] OR "Diverticulosis, Colonic/etiology" [MeSH] OR "Diverticulosis, Colonic/genetics" [MeSH] OR "Diverticulosis, Colonic/history" [MeSH]).

Rezultate: Încă de la emergența bolii diverticulare ca problemă de sănătate publică, la sfârșitul secolului trecut, ea a fost asociată cu dieta bogată în carbohidrați, săracă în fibre vegetale. Incidența maximă a bolii în țări ca SUA, Canada, Marea Britanie și statele nordice comparată cu rara apariție a sa în Africa sub-sahariană, date confirmate și de studiile ulterioare, întăresc ipotezele emise anterior. În regiuni precum

Asia, modelul lezional este caracterizat de o incidență relativ scăzută a diverticulozei colonice, cu dispoziție a diverticulilor predominant la nivelul colonului drept. Incidența diferită pe sexe în raport cu vârsta pacienților, indică posibilitatea existenței unor factori hormonal protectori. Studii ce provin din țări cu diversitate etnică mare aduc în discuție existența unei predispoziții genetice către boala diverticulară, fapt susținut și de cele câteva studii pe gemeni și rude de gradul I. **Concluzii:** Incidența în creștere a bolii diverticulare în țara noastră o fac să adere la modelul epidemiologic prezent în țările europene cu un statut socio-economic asemănător. Deși mult în urma statelor ce au adoptat dieta de tip "vestic" în ceea ce privește diverticuloza colonică, România are toate șansele să facă din aceasta o problemă de sănătate publică, în cazul în care nu sunt luate măsuri pentru identificarea și minimizarea expunerii populației generale la factorii de risc.

Cuvinte cheie: boală diverticulară, incidență, localizare

Abstract

Introduction: Associated with the Western diet and life style, diverticular disease is affecting more and more developing countries worldwide. Recent studies show an increase in incidence of the disease at young age, that raises the risk of complications, along with major consequences for the patient but also for the healthcare system.

Method: Systematic review of the literature with US National Library of Medicine and National Institutes of Health International PubMed Medline, using abstracts and articles available in PubMed Medline, Cochrane databases searching

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Results: Even from the rise of diverticular disease as a public healthcare problem, at the end of the previous century, it was associated with a diet rich in refined sugars, lacking vegetable fibres. The higher incidence in countries like U.S.A., Canada, United Kingdom and the northern states compared with its rare occurrence in the sub-Saharan African continent, strengthen the anterior assumptions. In regions like Asia, the disease pattern is characterized by a relatively low incidence of colonic diverticular disease, with distribution of diverticula mainly on the right colon. The different incidence by sex and age show the possible existence of hormonal protective factors. Studies from countries with a rich ethnic diversity, bring into question the probable genetic predisposition to diverticular disease, fact backed-up by the few studies on twins and 1st degree relatives available in the literature.

Discussion: The rising incidence of colonic diverticular disease in Romania makes our country adhere the epidemiologic model existing in countries with a close socio-economic status. Although with a lower incidence than countries that have adopted a Western diet, Romania is likely to encounter a public health problem, if certain measures to identify and minimise the population exposure to risk factors are not taken.

Key words: diverticular disease, incidence, localization

Introduction

Diverticular disease causes considerable acute and chronic suffering, decreasing the patient's life quality but also imposing impressive expenses for the healthcare system (1).

Prevention is not possible due to the lack of complete understanding of pathogenic mechanisms and predisposing factors. It is certain that diverticular disease has a heterogeneous distribution worldwide, its incidence being high in Western, developed countries (2).

At this moment there is no conclusive data to estimate the worldwide incidence of the disease, the standardized incidence rate of hospitalization for acute diverticulitis being available only in countries like the U.S., rising from 59 to 71 per 100,000 from 1998 to 2005 (data from a sample consisting of 20% of the U.S. population) (1).

Necroptic studies from the first part of the 20th century show a colonic diverticular disease incidence between 2-10% and 5-20% in patients whom underwent a colonoscopy examination (3), being more often encountered in male patients at that time (4). This distribution model is now observed in developing countries. Later studies showed an incidence levelling between genders (5).

Studies after the year 2000 showed an increasing incidence up 27% among patients that underwent colonoscopy (6), being more often encountered in elderly patients.

Worldwide incidence of diverticular disease

Worldwide diverticular disease has the highest incidence in the United States, Western Europe and Australia, (3,7), reaching 50% in the population aged 60 and above; on the other hand, in sub-Saharan countries the disease is rare and encountered in the 4th decade (8,9).

Nigeria reports an incidence as low as 9.4% among patients that underwent colonoscopy (10), and Calder finds a frequency of diverticular disease of 6.6% in Kenya (11).

The low incidence of diverticular disease in African countries can be due to limited access to healthcare in the general population, and to the low life expectancy in this area (12).

On average, the prevalence of diverticular disease among Caucasian Western patients whom underwent barium enema is 15-35%, being equally distributed between genders, but more frequent in the elderly, affecting the left colon in 90-99% of the cases (12,13).

In South-Eastern Asia, the prevalence varies between 8 and 25% (14,15), reaching a peak in the 5th decade (16,17), affecting the right colon in 70-98% of the cases (15,17,18). A study in Thailand retrospectively reviewing the double contrast enemas of 2,877 patients found diverticular disease in 28.5% patients (19).

Similar results were encountered in the population from Singapore and Hong-Kong (20,21). On the other hand in China and South Korea, the observed prevalence was 0.5-1.7%, affecting the right colon in 75% of the cases (22).

As the countries shift to a westernized lifestyle, an increase in diverticular disease incidence is noticed, affecting mainly the left colon (18).

Arabic countries offer dispersed studies on small groups of patients. A recent study on 3,649 patients published in Saudi Arabia shows an incidence of the diverticular disease close to 7.5%, the most exposed age being in the 6th decade (23), the lowest incidence being reported in Iran (2.4% in the population aged 50 and above) (24), while Jordan encounters a 4% incidence in a study conducted over a 3 year period (25). In 1980, in Israel the diverticular disease was encountered in 9.5% among the Arabic population, with a seven-fold incidence increase compared with the previous studies (26).

Even in smaller geographic areas significant variations in diverticulosis incidence are encountered.

In the United Kingdom a study on 1,000 patients published in 2011 shows a prevalence of colonic diverticular disease as high as 47% (27), compared to previous studies that show a prevalence only between 15-35% (12,13). In a series of necroptic studies from Germany diverticular disease is noticed in 49% of the cases, while in Norway, the reported incidence was 32.1% (27,28). In the late 20th century 12% of the Finland population had diverticular disease (30), and more recent studies show an increase in incidence with more than 50%,

mainly caused by population ageing and decreasing the amount of fibres in diet (31).

European developing countries show a lower incidence of colonic diverticular disease. Greece encounters diverticulosis in 22.9% (32) of patients in the beginning of the 21st century, and in Italy, data from an imagistic study shows an incidence of 16.5% (33). A Polish study among patients aged 30 and above shows the presence of the diverticular disease in 21.8% of the subjects (12).

In our country the scarce data regarding diverticular disease makes it impossible to calculate the incidence of the disease in the general population. However, a retrospective study showed an increasing frequency of diverticulosis among admitted patients from 1.29% in 2002 to 2.5% in 2005 (34).

Regarding age distribution the maximum incidence is noticed among patients aged 60 and above (34,35), data matching the worldwide published studies. Available data does not offer conclusive data considering gender distribution.

Incidence of diverticular disease relative to age

Diverticular disease was first attributed to elderly patients (36), with a maximal incidence in patients above 70 years old (35,36). Recent medical literature shows however an increase in diverticulosis incidence in young patients. The most important increase was encountered in the group aged 18-44, where the incidence per 1,000 pop. rose from 0.151 to 0.251 in only 7 years. The incidence in patients aged 45-64 knows a lesser increase (from 0.650 to 0.777 over the same period) (1,37).

Surprisingly, no significant changes in incidence were noticed in the group aged above 65 (1).

Some studies shape the idea that more aggressive forms of disease are encountered in patients younger than 40, with a five-fold risk of complications when compared to the patients above 40 from the same group (39).

European countries with a socio-economic status close to our country report a 5.3% diverticular disease frequency in patients aged 30-39, 8.7% in those aged 40-49, 19.4% between 50 and 59 and up to 29.6 in subjects in the 7th decade, while maximal incidences were found in patients aged 70 to

79 and above 80 of 40.2% and 57.9 respectively (12).

Studies published in Romania are in conformity with those published in the international medical literature, the maximal incidence being encountered in patients aged 70-79 (36.72%) followed by those in their 7th decade (27.62%) (34), incidence close to that found in European countries with similar socio-economic climate. Golder&al. estimates that each passed year raises the individual risk for diverticular disease by 6% (27).

Gender distribution of diverticular disease

Gender distribution has also changed over the years, initially the diverticular disease being encountered more often in males (4). Subsequent studies failed yet to show a significant higher rate of diverticulosis in males (5). However, recent data indicates that males under 50 have a higher incidence of diverticular disease, while after the 4th decade the illness is more frequent in females, as shown by a study from the United Kingdom between 1989 and 2000 (7,38,39). Similar results were obtained in Canada, where males under 50 were more prone to diverticular disease (7).

A Korean study shows an incidence by gender ratio of 2.2:1 males:females, where the mean age of the patients was 54.9 (41).

European countries like Poland show less difference between genders, the incidence in male patients being 20.2% while female patients had a slightly higher percentage – 22.7% (12), whereas in Italy the male:female incidence ratio was 1:1 (42).

In Romania available studies don't show conclusive data regarding gender distribution, some authors reporting a male:female ratio of 1.4 (35) while others show a slight predominance among women: 56.27% (34).

Although a certain predisposition by genders for the diverticular disease cannot be found, some studies suggest that hormones may play a role.

Incidence of diverticular disease among different ethnic groups

Countries with a heterogeneous population like the United

Figure 1. Incidence of diverticular disease around the globe (personal collection using GunnMap)

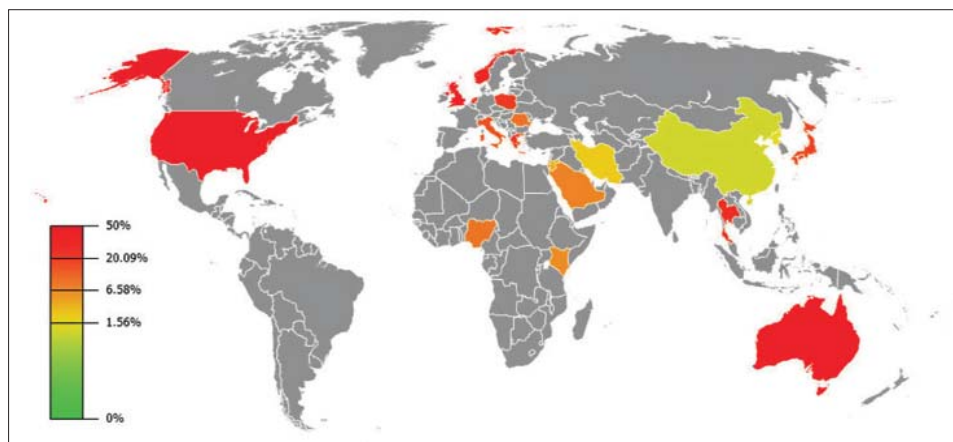


Table 1. *Geographic prevalence of diverticular disease*

Author	Country	Year	Investigation	No. cases	Diverticulosis	left	Right	Pancolonic
Loshirawat (19)	Thailand	2009-2011	DCBE	2877	820 (28.5%)	13.30%	22.30%	3.4
Azzam (23)	Saudi Arabia	2007-2011	Colonoscopy	3649	270 (7.4%)	62%	13%	
Faucheron (57)	France	2004-2005	Colonoscopy	796	318 (40%)		32.40%	
Alatise (10)	Nigeria	2007-2011	Colonoscopy	320	30 (9.4)			
Annibale (42)	Italy	2012		598	598	78%		
Kopylov (62)	Israel	2006-2011	Colonoscopy	3175	17.40%			
Fong (16)		2001-2002	Barium enema	1663	45%			
Golder (27)	U.K.	2004-2006	Colonoscopy. barium enema	1000	447	322	26	68
Warner (7)	Canada	1988-2002			133875			
Blachut (12)	Poland	1999-2002	Barium enema	1912	417 (21.8%)	353	73	61

DBCE - double contrast barium enema

Kingdom show that Asian people and non-African blacks present a 0.43 and respectively 0.40 less likely percentage to have the disease when compared with whites from the same geographic area. African blacks are 2.87 more likely percentage to develop the disease than non-African black people (27).

Other data show a 4.4% incidence of diverticular disease among patients of Indian-subcontinent Asian origin, compared with other ethnic groups present in the U.K. (43), similar results were also found in previous studies when comparing the incidence in countries with mixed population like Nigeria, Singapore, Fiji and Scotland (44).

Trials in Sweden found a lower hospital admittance and mortality caused by complications of the diverticular disease in non-Western immigrants, but this difference fades after a relative short residence period (45).

Although the onset of diverticular disease was strongly correlated with a low fibre diet, studies didn't show a levelling in incidence between immigrants and the native population. In the Netherlands studies show an incidence among Turkish immigrants as low as 7.5% when compared with the 50% incidence found in Dutch with Turkish descent in the same community (46). There is no data regarding the naturalisation process, and whether the dietary customs were preserved.

In Romania, such data is not available yet, mainly due to the relatively small ethnic diversity.

Heritability and familial aggregation of diverticular disease

A study between 1977-2011 on 142,123 patients in Denmark identified that 1st degree relatives of patients with diverticulosis are 2.92 more likely to develop the disease when compared with the general population. The relative risk for a sibling to develop diverticular disease was 14.5 in monozygotic versus only 5.5 in dizygotic twins. The correlation was more obvious in monozygotic female twins than between monozygotic male twins (47).

Some clinical trials show some genetic diseases are associated with a higher incidence of diverticular disease. Patients with Ehlers-Danlos syndrome (47,48), Williams-

Beuren (50), Coffin-Lowry (51) and renal polycystic disease (52) are prone to develop diverticula with colonic or other localization.

The association with collagen disease can offer information regarding the mechanisms that lead to diverticula formation (53). These syndromes, all have in common extracellular matrix defects suggesting that the elastin and collagen accumulation in the smooth muscle may be a condition prior to diverticula formation (53,54).

Colonic diverticular distribution

Uneven distribution of diverticula along the colon depending on the geographic area comes in addition to the heterogeneous incidence of diverticulosis worldwide. Diverticulosis with a left colon distribution is found in Western countries with a high socio-economic status (1,3,35), while in Asian countries the diverticular disease is mainly located on the right colon (18-20). Studies conducted in Tokyo, Hong-Kong and Singapore found a right sided diverticulosis distribution in up to 70% of the cases (14,18,19). Korea reports an even higher percentage (83%) of right colon diverticulosis (41).

Arab countries report a transitional diverticula distribution along the - colon but with a slight predominance of the left colon - 62% (23).

Data regarding colonic distribution of diverticular disease in the African continent are not conclusive. Countries like Uganda (Kampala) report mainly left colon diverticulosis (56), while in Ghana, mainly the whole colon was affected (8).

In the U.S., right colonic diverticulosis is rarely found, some studies showing a 99% distribution of diverticula on the left colon (37), and in countries like Sweden the percent is nearly as high - 90-98% (13). U.K. also reports an uneven distribution, with diverticulosis affecting the left colon in 72% of the cases (27). Similar data was found across Europe, the left colon being more affected: France 67,6% (57), Poland 69% (12) and Italy 78% (42).

In Romania, retrospective studies show a 90% diverticula on the left colon (35).

Initial data suggested that right sided diverticula are „true” diverticula - their wall containing all layers found in the

colonic wall – and thus they are congenital (20,36,57), and left sided diverticula are “false” not having in their wall the muscular layer, as a result of intraluminal pressure increase.

The incidence increase of diverticulosis in Asian countries with a high socio-economic status links the diverticular disease to dietary customs, especially to a low fibre diet (3,18). This hypothesis is confirmed by studies that show that the stool transit time is longer in patients with a low fibre diet (59), thus increasing the intraluminal pressure.

This fact is supported by the increasing incidence in developing countries (59,60). In some African countries significant differences are encountered even between the urban and rural population (60).

Conclusions

Progressive population ageing and better access to medical services worldwide might partially account for the rising incidence of diverticular disease. Nevertheless the strong association with diet shift cannot be ignored. Romania fits in the European pattern, with an incidence close to the surrounding, developing countries, but significantly lower than the well industrialised countries. Our country is likely to encounter a public health problem, if certain measures to identify and minimise the population exposure to risk factors are not taken.

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