REVIEW ARTICLE

Impact of socioeconomic status on incidence, mortality, and survival of colorectal cancer patients: a systematic review

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Colorectal cancer (CRC) is one of the most commonly diagnosed cancers in the world.[1] CRC-associated mortality rates are high, with approximately 610,000 deaths recorded in 2008.[1] Besides genetic predisposition, several risk factors are suggested to play a role in the development and progression of CRC, such as obesity,[2-6] smoking, and diet.[6] At the same time, factors that protect people from CRC are also well established. Several studies during the past years have demonstrated that endoscopic screening is the most important factor, not only in reducing the incidence of CRC, but also in decreasing CRC-related mortality.[7-14]

The term socioeconomic status (SES) designates the position of an individual within a given social structure. Social inequalities result from a skewed distribution of material and nonmaterial goods among the members of the society. Most commonly, SES is measured by the meritocratic triad of profession, income, and education. However, there are several other SES indices available, comprising mainly aggregated data, such as the Townsend, Jarman, and Carstairs indices,[15] and many studies use newly set up indices. The lack of a uniform set of indices for measuring SES impedes comparability of studies investigating the impact of SES on morbidity and mortality in specific population groups.

The impact of socioeconomic inequalities has been studied in the context of several malignant diseases.[16-20] Data on the impact of SES on CRC, however, are sparse. CRC screening programs are available in many countries, but indiscriminate inclusion of a population into such a program is expensive and, in the context of exploding health care costs, might not be economically feasible in the long term. To make a CRC screening program cost-effective and efficient, potential risk factors as well as high-risk populations should be evaluated. This review analyzes the impact of SES on CRC incidence, mortality, and survival, enabling identification of high-risk groups.

Abbreviations: CI, confidence interval; CRC, colorectal cancer; HR, hazard ratio; OR, odds ratio; RR, relative risk; SES, socioeconomic status.

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METHODS

For a systematic analysis, the electronic database of PubMed was searched by using the following combination of search terms (date of search: June 4, 2013): (social[All Fields] or socioeconomic[All Fields]) AND (status[All Fields] or class[All Fields] or position[All Fields]) AND ("colorectal neoplasms"[MeSH Terms] or ("colorectal"[All Fields] AND "neoplasms"[All Fields]) or "colorectal neoplasms"[All Fields] or ("colorectal"[All Fields] AND "cancer"[All Fields]) or "colorectal cancer"[All Fields]) or ("colonic neoplasms"[MeSH Terms] or ("colonic"[All Fields] AND "neoplasms"[All Fields]) or "colonic neoplasms"[All Fields] or ("colon"[All Fields] AND "cancer"[All Fields]) or "colon cancer"[All Fields]) or ("rectal neoplasms"[MeSH Terms] or ("rectal"[All Fields] AND "neoplasms"[All Fields]) or "rectal neoplasms"[All Fields] or ("rectal"[All Fields] AND "cancer"[All Fields]) or "rectal cancer"[All Fields]) or CRC[All Fields]) AND ("English"[Language] or "German"[Language]).

Publications without an abstract were excluded. Moreover, only those articles published since January 1995 were included. Article abstracts were read and were considered for further analysis if they focused on the impact of SES on incidence, mortality, or survival of colon, rectal, or CRC. SES had to be defined by socioeconomic index or data on profession, income, or education. As shown in Figure 1, 97 articles were found to be suitable for further analysis, and the full texts of the publications were read. Of these, 51 had to be excluded for the following reasons: focus only on late-stage CRC (exclusion was made because in most studies, it was not easy to differentiate between the impact of SES on CRC and the impact of SES on access to therapy. This was further complicated by a lack of multivariate regression in most studies, which failed to clearly differentiate between the impact of SES on CRC and its impact on therapy), focus on reasons for social inequalities and not their impact on CRC incidence, mortality or survival and focus only on special ethnic or therapeutic subgroups (such as focus only on Asians or Hispanics in the United States or focus only on patients with special surgical or chemotherapeutic treatment). To ensure completeness of data, included articles were compared with reference lists of review articles

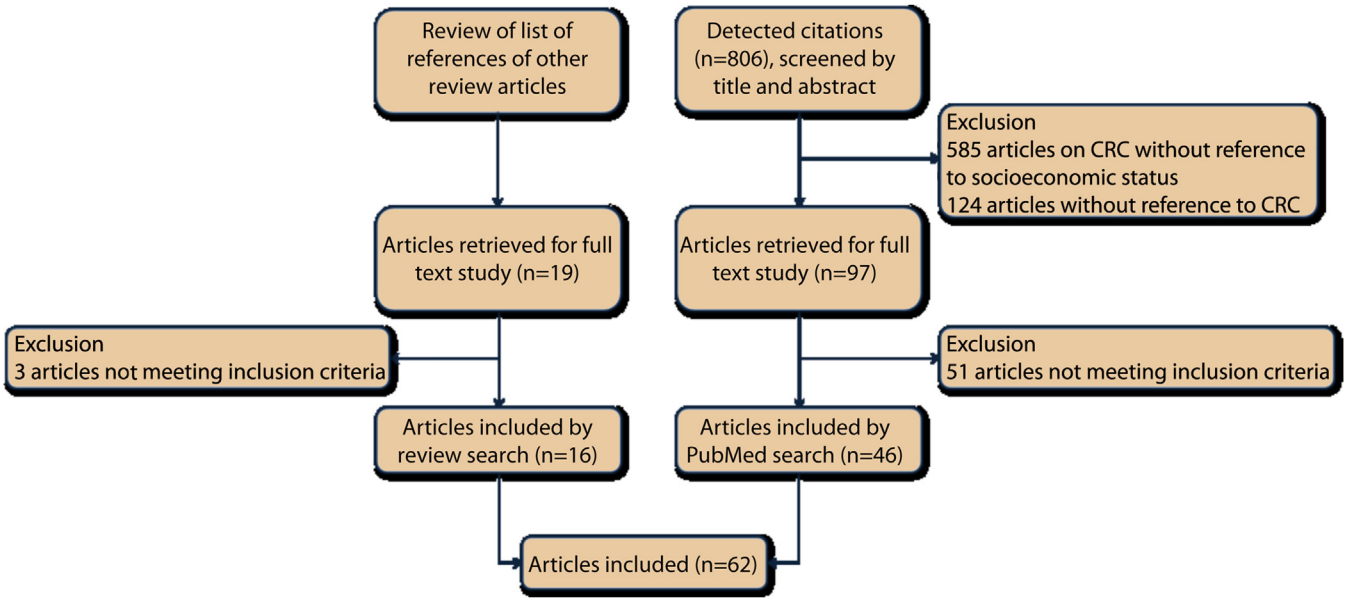

Figure 1. Flow chart of the search process. *CRC*, colorectal cancer.

on this issue published within the past 5 years,[21,22] which yielded 19 more articles of potential interest, of which 16 were included in the review. Thus, a total of 62 articles were included in this systematic review.

Data extracted were authors, journal, year of publication, country where the study was conducted, time interval of analysis as well as follow-up time, type of SES measure (distinguishing individual and neighborhood data) and source of data on SES, cancer (sub)site and source of data on CRC, number of patients included, primary endpoints (incidence, mortality, survival) as well as results.

RESULTS

Association between CRC incidence and SES

Results are differentiated by study endpoints (incidence, mortality, and survival). Tables 1 through 8 show the results of 21 studies reporting on the impact of SES on the incidence of colon, rectal, or CRC. Ten studies are from Europe, 6 from the United States, 2 from Asia, 2 from Australia, and 1 from South America. Eighteen studies provide data on the incidence of colon cancer, 15 on the incidence of rectal cancer, and 3 on the incidence of CRC without site-specific information. Eleven studies present individual data, 8 provide aggregated data, and 2 provide both types of data. Indices of SES were used in 8 studies. In 4 studies, each incidence rate ratio or odds ratio (OR) was reported. In 4 studies, the standardized incidence or rate ratio was reported; in 1 study, the relative index of inequality, and in 1 study, the Pearson correlations were reported. Most frequently, in 6 of the studies, the relative risk (RR) was reported.

There was a large variance in the results of the studies analyzed in this review. Although some studies reported that the risk of the development of CRC among people with a low SES was reduced, others reported exactly the opposite, namely, an increased CRC risk in this population. The lowest risk for the development of colon cancer was reported in a study by Pisa et al,[23] who investigated the impact of migration and SES on CRC; this study included a total of 1953 patients with CRC, of whom 1225 patients had colon cancer: the OR for the development of colon cancer was 0.33 (95% confidence interval [CI], 0.18-0.63) for women and 0.26 (95% CI, 0.15-0.43) for men. In their study examining the association between education and the risk of the development of cancer, Mouw et al[24] reported that women had the highest risk of colon cancer (multivariate adjusted: RR 1.37; 95% CI, 1.06-1.77). For men, the results were nonsignificant (RR 1.10; 95% CI, 0.94-1.29). In this study, data for 2791 patients with colon cancer were analyzed. Notably, studies from the United States reported an association between increased risk of colon cancer and low SES, whereas according to most European studies, the risk was reduced or nonsignificantly altered. Five of the 10 European studies reported a significantly reduced incidence of colon cancer among people with a low SES.[20,23,25-28]

There are only 3 European studies reporting significant results on rectal cancer. According to 1 study, men with a low SES had an increased risk of rectal cancer (RR 1.27; 95% CI, 1.07-1.50 to RR 1.57; 95% CI, 1.15-2.14),[27] whereas the results of another study showed this risk to be lower (HR 0.41; 95% CI, 0.31-0.53).[28] Interestingly, both studies are from Italy and included comparable numbers of individuals investigated over almost the same length of time. In both studies, SES was assessed by using education as the index measure. In the third study, the risk of the development of rectal cancer in men was found to be either increased or decreased, depending on the SES variable used. Low SES as measured by income was associated with an increased risk of the development of rectal