Financial toxicity of cancer care in low and middle-income countries: a systematic review and meta-analysis

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Abstract

Introduction: The costs associated with cancer diagnosis, treatment and care present enormous financial toxicity. However, evidence of financial toxicity associated with cancer in low and middle-income countries (LMICs) is scarce.

Aim: To identify the extent of cancer-related financial toxicity and how it has been measured in LMICs.

Methods: Four electronic databases were searched to identify studies of any design that reported financial toxicity among cancer patients in LMICs. Random-effects meta-analysis was used to derive the pooled prevalence of financial toxicity. Sub-group analyses were performed according to: costs; and determinants of financial toxicity.

Results: A total of 31 studies were included in this systematic review and meta-analysis. The pooled prevalence of financial toxicity was 56.96% [95% CI, 30.51, 106.32]. In sub-group meta-analyses, the financial toxicity was higher among cancer patients with household size of more than four (1.17% [95% CI, 1.03, 1.32]; $p = 0.02$; $I^2 = 0\%$), multiple cycles of chemotherapy (1.94% [95% CI, 1.00, 3.75]; $p = 0.05$; $I^2 = 43\%$) and private health facilities (2.87% [95% CI, 1.89, 4.35]; $p < 0.00001$; $I^2 = 26\%$). Mean medical costs per cancer patients were $2,740.18 [95% CI, $1,953.62, $3,526.74]. The ratio of cost of care to gross domestic product (GDP) per capita varied considerably across the LMICs included in this review, which ranged from 0.06 in Vietnam to 327.65 in Ethiopia.

Conclusions: This study indicates that cancer diagnosis, treatment and care impose high financial toxicity on cancer patients in LMICs. Further rigorous research on cancer-related financial toxicity is needed.

Introduction

New cases and deaths from cancer continue to increase in low and middle-income countries (LMICs). During the period 2012-18, the annual new cancer cases increased by from 8 million to 9.9 million and cancer deaths increased from 5.3 million to 6.7 million in LMICs (1, 2). Governments have a responsibility of providing appropriate, accessible and affordable services to the increasing number of cancer patients. However, multiple influential factors, such as: unpredictable political climate; inadequately trained cancer care providers; poor coordination; and the increasing cost of cancer care make it difficult to achieve high-quality prevention, early detection, diagnosis, treatment, survivorship and palliative care services (3).

The cost of care is an important barrier to many cancer patients seeking treatment and care. Several LMICs spend about 4% to 7% of their gross domestic product (GDP) on health, with regional differences in patients' ability and willingness to pay for medical and non-medical care (4). In most LMICs, there is little or lack of widespread health insurance coverage. Even among patients with health insurance, many are inadequately protected against the costly demands of cancer care because of high costs of insurance, including higher co-payments and increased deductibles. Cancer patients often spend

relatively high out-of-pocket for cancer care (5). The financial support of informal carers is substantial; yet estimates of informal caregiving costs in cancer care have been neglected. Cancer patients and informal caregivers who are often, but not always, family members are vulnerable to losing employment and have a greater risk of personal bankruptcy (6, 7).

There remains a lack of a uniform terminology in the literature to describe the medical and non-medical cancer care costs that result in financial burden for cancer patients and their informal caregivers. ‘Financial toxicity’ refers to the detrimental economic effects of cancer care experienced by cancer patients (6). Terms commonly used interchangeably with financial toxicity include financial or economic difficulty, financial hardship, financial risk and economic stress (8). Efforts have been made to develop tools for measuring cancer patients risk of experiencing financial toxicity, which include: COmprehensive Score for Financial Toxicity (COST) (9); Personal Financial Wellness (PFW) Scale (10); and Cancer Survivors’ Unmet Needs (CaSUN) measure (11). These tools were developed and/or validated with cancer patients from high-income countries (HICs) in mind. The lack of practical guidance and tools that are psychometrically acceptable across settings in LMICs for identifying cancer patients at risk of developing financial toxicity hinder cancer care providers from implementing policies.

A recent systematic review with included studies mostly from HICs identified that cancer patients who were younger, non-white, unmarried, living with dependents and residing in non-metropolitan service areas are more at risk of financial toxicity (12). There are no systematic reviews and meta-analyses on financial toxicity among cancer patients in LMICs, which creates a significant gap in terms of designing and implementing innovative strategies. The aim of this review is to identify the extent of cancer-related financial toxicity and how it has been measured in LMICs.

Methods

This systematic review followed the preferred reporting items for systematic review and meta-analysis (PRISMA) guideline (13). It was registered with the international Prospective Register of Systematic Reviews (PROSPERO) [CRD42020207205] (14).

Eligibility criteria

The inclusion criteria were as follows: primary studies of any design that reported cancer care-related financial toxicity; studies conducted in any country classified as LMIC by the World Bank Group in 2020; studies that focused on people with any type of cancer; studies published in peer-reviewed journals; and in the English language from the year 2000. Editorials, opinion pieces, comments, letters, reviews and studies focused on high-income settings were excluded.

Information sources

Four electronic databases were searched, namely: Ovid Embase; Ovid MEDLINE(R) and In-Process & Other Non-Indexed Citations; Cumulative Index of Nursing and Allied Health Literature (CINAHL); and Cochrane

Library. A hand search of the reference lists of included studies was performed to supplement the database search.

Search strategy

Databases were searched on September 7, 2020. The search strategy included terms relating to the following concepts: cancer; cancer patients; delivery of health care; cost of illness; cancer survivors; and LMICs. Medical subject headings, keywords and free text terms were combined using “AND” or “OR” Boolean operators. The initial search strategy was developed in MEDLINE (Ovid) (Supplementary Table 1).

Study selection

Two authors independently screened titles and abstracts of citations retrieved by the search for relevance against the inclusion criteria, and full texts of articles were obtained. Ten per cent of the articles were independently screened by a third author. Disagreements were resolved through discussion.

Data extraction

An electronic data extraction form was developed, and full-text data extraction was performed by three authors. The extracted data was reviewed, discussed in a team meeting and disagreements were resolved through consensus. Data extracted included: general information; study eligibility; setting; cancer type; study design; data collection; participants; outcome measures; and results.

Quality assessment

Two reviewers applied the Joanna Briggs Institute Critical Appraisal Checklist to assess the risk of bias in each study (15). Disagreements were resolved by discussion. To enable comparison, each item in the appraisal checklist was rated using a three-point scale, with: “1 = yes; -1 = no; and 0 = not applicable”. The sum was divided by the number of items in the appraisal checklist and multiplied by 100%. The risk of bias scores were categorised as: ≥ 80% (low); 60% to 80% (moderate); and < 60% (high).

Data analysis

Meta-analysis was employed for studies that reported quantitative data. A random-effects meta-analysis of odds ratio (OR) was used to calculate pooled data with 95% confidence intervals (CI). Heterogeneity among studies was estimated using the I^2 index, with values classified as: “low heterogeneity” (less than or equal to 25%); “moderate heterogeneity” (26% - 50%); and “high heterogeneity” (greater than 50%) (16, 17). Leave-one-out sensitivity analysis was performed to examine whether single studies had a disproportionally excessive influence. Sub-group meta-analyses were conducted to determine the potential sources of heterogeneity. Forest plots were generated. Probability values below 0.05 were considered statistically significant. Data were analysed using Review Manager 5.3.

A narrative synthesis was undertaken for studies that reported qualitative data by comparing similarities and differences across studies (18). Studies were independently coded by two authors by applying the socio-ecological framework to determine the coping strategies adopted to reduce financial toxicity. Emerging themes were explored, refined and any discrepancies resolved through discussion.

Results

The electronic databases searches yielded 4,798 articles, with another two identified through hand search. A total of 324 articles were excluded due to duplication. The title and abstract of remaining articles were screened and 4,398 articles were excluded because they did not meet the inclusion criteria. The full-text of the remaining 78 articles were then reviewed for eligibility, of which 31 were found to be eligible for inclusion. The PRISMA flow diagram provides detail of the screening process (Figure 1).

Characteristics of included studies

Table 1 presents the characteristics of included studies. The 31 studies were conducted in four different regions, including Asia (China, n = 10; Iran, n = 3; Thailand, n = 3; Turkey, n = 3; Vietnam, n = 2; and Malaysia, n = 2); Africa (Kenya, n = 2; Ethiopia, n = 1; and Morocco, n = 1); Middle East (Jordan, n = 1); South America (Brazil, n = 1); and Europe (Serbia, n = 1), with a multinational study exploring financial toxicity across Malaysia, Thailand, Indonesia, Philippines, Vietnam, Laos, Cambodia and Myanmar (19). The total sample size was 120,883, which ranged from 30 to 45692 participants. Majority of the participants were females (n = 65,564). The mean age of the participants was 57.7±7.8 years and ranged from 42 to 72 years. The majority of the studies focused on specific cancer types, such as: lung (20-24); breast (25-27); colorectal (28, 29); liver (30); ovarian (31); prostate (32); and stomach (33).

Measuring financial toxicity and health-related quality of life

Most of the studies used unvalidated self-designed questionnaires to measure the financial toxicity related to cancer diagnosis, treatment and care. Answers to questions, such as: “How much did you pay for the medical expense last month?”’; and “How much did you spend on the disease-related expenses other than medical expenses?” were often used to measure the financial toxicity during cancer treatment and care (21). One study applied a pre-existing generic financial assessment instrument, namely the PFW scale, which consists of: five items on the psychosocial; two items on financial resources; and one item on coping strategies (34). One study utilised the Chinese version of the cancer-specific Comprehensive Needs Assessment Tool (CNAT) (35).

Three instruments were used in six studies to measure the health-related quality of life (HRQoL) of cancer patients in general and disease-specific aspects of life (19, 21, 22, 31, 32, 34). The most frequently used HRQoL instrument was the Functional Assessment of Cancer Therapy (FACT). In particular, the FACT is a two-part instrument that assesses general HRQoL related to cancer and cancer therapy (FACT-G) and tumour-specific measures, such as prostate (FACT-P).

Another instrument that was often used in the assessment of HRQoL in cancer patients was the European Quality of Life Five Dimension (EuroQol/EQ-5D), which measured well-being in five dimensions: usual activities; self-care; pain/discomfort; anxiety/depression; and mobility (19, 22). The EuroQol/EQ-5D combines self-assessment with a valuation of quality of life in which full health is scored at “one” and death is “zero”. Two studies used the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30), which consists of 30 core items with five functional scales (cognitive, emotional, physical, role and social), three symptom scales (fatigue, pain and vomiting/nausea) and a global health and quality-of-life scale (22, 31).

Prevalence of financial toxicity

Three studies provided prevalence estimates (36-38) enabling a meta-analysis of the prevalence of financial toxicity from cancer diagnosis, treatment and care. The pooled prevalence of financial toxicity was 56.96% [95% CI, 30.51, 106.32] (see Figure 2). The random-effects meta-analysis showed that the pooled prevalence of financial toxicity among cancer patients varied from 17.73% [95% CI, 15.76, 19.94] to 93.38% [95% CI, 87.21, 99.99] in any cancer type after separating the data on rural and urban in one study (38). Rural dwellers had a substantially higher prevalence of financial toxicity estimates (93.38% [95% CI, 87.21, 99.99]). However, the heterogeneity in the ratio of prevalence was extremely high (I^2 = 100%).

Mean medical costs

Table 2 presents the results of the mean estimates of cancer care costs using random-effects meta-analysis and sub-group meta-analysis. Medical costs were categorised into seven cost items: consultation; diagnosis; treatment, including surgery, radiotherapy, chemotherapy, hormone therapy, combined modalities and palliative/supportive care; inpatient care; outpatient care; and follow-up care. In total, 11 studies presented data on mean medical costs (21, 23-25, 27, 32, 33, 37, 39-41). Overall mean medical costs were $2,740.18, which ranged from $1,953.62 to $3,526.74 per cancer patient. Components of the overall mean medical costs included: $2,366.00 [95% CI, 1920.76, 2811.24] in any cancer type; $1,902.95 [95% CI, $-655.85, $4,461.74] in lung cancer; $4,961.80 [95% CI, $4,892.80, $5,030.80] in stomach cancer; $91.60 [95% CI, $72.87, 110.33] in breast cancer; and $6,141.30 [95% CI, $5,717.88, $6,564.72] in prostate cancer, with GDP per capita ranging from $858 in Ethiopia to $10,262 in China.

Three studies reported data on mean diagnostic costs (27, 32, 39). Expressed as random-effect estimates, mean diagnosis costs were higher for any cancer type ($138.90 [95% CI, $126.59, $151.21]; $p < 0.00001$), as well as breast cancer in women ($16.02 [95% CI, $15.12, $16.92]; $p < 0.00001$) and prostate cancer in men ($205.80 [95% CI, $168.32, $243.28]; $p < 0.00001$). Consultation costs significantly favoured higher medical costs ($p < 0.00001$) (39). The ratio of consultation costs to GDP per capita ranged from 1.77 to 2.16 in Kenya.

Mean medical costs also varied depending on the type of treatment modality. Mean medical costs of surgery were measured in three studies from Kenya (39), Vietnam (27) and Iran (32) with GDP per capita ranging from $1,817 to $5,506. The pooled mean medical costs of surgery were $1,678.80 [95% CI, $62.39, $3,295.20]; $p = 0.04$; $I^2 = 100\%$), which varied greatly from breast cancer ($82.35 [95% CI, $76.86, $87.84]; $p < 0.00001$) to prostate cancer ($3,709.50 [95% CI, $3,396.01, $4,022.99]; $p < 0.00001$). On the other hand, data regarding overall mean medical costs of radiotherapy were available in two studies (27, 32). A non-significant increase in total mean costs of radiotherapy favouring low medical costs burden was observed ($4,131.50 [95% CI, $-3,923.69, $12,186.69]; $p = 0.31$; $I^2 = 100\%$), with higher heterogeneity. The ratio of radiotherapy costs to GDP per capita ranged from 0.59 in Vietnam to 154.78 in Iran.

The sub-group meta-analysis of the total mean medical costs of chemotherapy favouring high financial toxicity were observed ($6,555.98 [95% CI, $-97.19, $13,014.76]; $p = 0.05$; $I^2 = 100\%$), showing an increase mean costs of: $476.48 per breast cancer patients; $1,372.50 per any cancer type; $10,540.00 per lung cancer patient; to $14,181.30 per prostate cancer patient. Two studies presented data on mean medical costs of combined surgery, chemotherapy and radiotherapy (23, 39), with total mean costs of $9,888.14 [95% CI, $-4,480.83, $24,257.12] and a substantial heterogeneity ($I^2 = 100\%$). One study reported that combined surgery and radiotherapy for any cancer type resulted in even higher associated mean medical costs ($1,749.35 [95% CI, $1,257.90, $2,240.80]; $p < 0.00001$) (39).

Mean medical costs of palliative care were measured in four studies from Kenya (39), Vietnam (27), Brazil (41) and Turkey (23) with GDP per capita ranging from $1,817 to $9,042. The random-effects meta-analysis estimated the total mean medical costs attributed to palliative care as $3,741.28 [95% CI, $2,241.19, $5,241.37]. Also, two studies conducted in Ethiopia (37) and Turkey (25) reported data on mean medical costs of outpatient care, which was significantly associated with higher financial burden ($673.03 [95% CI, $488.40, $857.66]; $p < 0.00001$; $I^2 = 85\%$). One study from Vietnam (27) with GDP per capita of $2,715 reported the mean medical costs of follow-up care in breast cancer patients as $356.24 ranging between $311.36 to $401.12 per patient.

Mean non-medical costs

Non-medical costs had two main subcomponents: direct non-medical costs; and indirect non-medical costs. Two studies conducted in Iran and Turkey with GDP per capita ranging from $5,506 to $9,042 reported quantitative data on mean non-medical costs (24, 32). The overall pooled mean indirect non-medical costs were $2,402.47 [95% CI, $-2,356.15, $7,161.09], with $17.34 [95% CI, $11.87, $22.80] per lung cancer patient and $4,873.93 [95% CI, $3,604.88, $6,142.98] per prostate cancer patient. However, there was high heterogeneity ($I^2 = 98\%$).

The total mean direct non-medical costs as reported by one study from Turkey were $334.00 [95% CI, $333.74, $334.26] per lung cancer patient (24). Mean direct non-medical costs were observed to be significant ($p < 0.00001$). Components of the direct non-medical costs included disease-related transfer, accommodation, informal and transportation costs. It was observed that mean transportation costs

($162.00 [95% CI, $125.307, $198.693]; p < 0.00001) were responsible for 48% of the total mean direct non-medical costs incurred by lung cancer patients (24). Also, informal costs were associated with significantly higher mean direct non-medical costs among prostate cancer patients, with mean costs of $2,454.70 ranging between $2,171.84 and $2,737.56 (p < 0.0001) (32). The ratio of informal costs to GDP per capita ranged from 39.44 to 49.72 in Iran.

Determinants of financial toxicity

Figure 3 presents pooled estimates of the determinants of financial toxicity. The sub-group meta-analyses showed that cancer patients with a household size of more than four were associated with a significant increase in financial toxicity (1.17% [95% CI, 1.03, 1.32]; p = 0.02; I^2 = 0%). There was no significant heterogeneity among the three included studies (34, 42, 43). The meta-analysis revealed that cancer patients who received more than six cycles of chemotherapy were almost two times more likely to experience high financial toxicity (1.94% [95% CI, 1.00, 3.75]; p = 0.05; I^2 = 43%). In three of the included studies (36, 37, 43), it was observed that cancer patients who attended private health facilities during the course of their disease were statistically associated with high-level financial toxicity (2.87% [95% CI, 1.89, 4.35]; p < 0.00001; I^2 = 26%). One study indicated that prolonged length of hospital stay was significantly related to cancer patients encountering higher financial toxicity (1.88% [95% CI, 1.68, 2.11]; p < 0.00001) (43).

Using data from six studies (19, 34, 36, 38, 42, 43), the pooled estimate for health insurance as a determinant of financial toxicity among cancer patients was not a significant factor (1.19% [95% CI, 1.00, 1.42]; p = 0.06; I^2 = 33%). However, according to the leave-one-out sensitivity analysis, the random-effects meta-analysis showed that not having health insurance was a significant risk factor for exposure to financial toxicity (1.29% [95% CI, 1.03, 1.61]; p < 0.03; I^2 = 42%) when removing one study from China (38) from the pooled analysis. The sub-group meta-analyses indicate no statistically significant association with cancer-related financial toxicity by gender (0.97% [95% CI, 0.65, 1.45]; p = 0.89; I^2 = 70%), stage at diagnosis (1.16% [95% CI, 0.79, 1.70]; p = 0.46; I^2 = 32%), level of education (0.73% [95% CI, 0.27, 2.03]; p = 0.55; I^2 = 97%) or income level (1.74% [95% CI, 0.68, 4.47]; p = 0.25; I^2 = 97%).

Health-related quality of life burden

Seven studies reported data on illness cost and HRQoL (19, 21, 22, 31, 32, 34, 35). Random-effects meta-analyses showed that cancer patients experiencing high financial toxicity was significantly linked to low HRQoL (12.63 [95% CI, 9.04, 16.21]; P < 0.00001; I^2 = 89%), with higher heterogeneity across studies (Supplementary Figure 1). The HRQoL areas significantly affected included physical well-being (11.05 [95% CI, 6.17, 15.93]; I^2 = 13%; p < 0.00001); social well-being (13.49 [95% CI, 4.77, 22.20]; I^2 = 82%; p = 0.002), emotional well-being (16.69 [95% CI, 4.17, 29.21]; p = 0.009; I^2 = 87%) and functional well-being (13.22 [95% CI, 7.63, 18.81]; I^2 = 7%; p < 0.00001).

Coping strategies for reducing financial toxicity

Five studies described different coping strategies that cancer patients and their families adopted to meet the costs of their illness (37, 44-47). These coping strategies can be described at four levels, namely: individual level; relationship level; community level; and societal level (see Figure 4). Coping strategies at the individual level included: using personal savings; selling assets; skipping bill payments; borrowing or incurring bank debt; and delaying/forgoing treatment (33, 37, 45, 47). On the other hand, strategies at the relationship level include: receiving financial support from family and friends; and emotional support from partners, friends and family members (44). Community level strategies commonly reported included obtaining financial assistance from workplaces, neighbourhoods, churches and non-governmental/charity organisations (37, 45). Strategies at the social level included: creating supportive policies, including a waiver to help cancer patients offset their medical bills; and promoting a pleasant social support environment, such as food, accommodation and transport for treatment programme (44, 45).

Quality assessment

Supplementary Figure 2 presents the results of the quality assessment of the included studies. Sixteen studies achieved an overall low risk of bias. Thirteen studies were rated as a moderate risk of bias often because there were no: identification of potential confounders; evidence of strategies to deal with effects of confounding factors; and/or description of statistical adjustment in data. Overall, two studies were rated as high risk of bias because of: outcome measurement; and statistical analysis issues. Outcome measurement issues were due to the use of unvalidated instruments and lack of clear definition and documentation of outcomes.

Discussion

This systematic review and meta-analysis describes the prevalence of cancer-related financial toxicity, its determinants and how it has been measured in LMICs based on available data published from 2007 to 2020. The prevalence of financial toxicity among cancer patients in LMICs varied significantly, ranging from 17.73% to 93.38%. The mean medical costs per cancer patients were $2,740.18 and the total mean costs attributable to surgery, radiotherapy, chemotherapy, hormone therapy and palliative care were $1,678.80, $4,131.50, $6,555.98, $1,471.27 and $3,741.28 respectively. Informal care costs, which were classified as non-medical costs were hardly measured in the studies reviewed. Overall, informal costs represented $2,454.70, which ranged between $2,171.84 and $2,737.56 per prostate cancer patient. The ratio of cost of care to GDP per capita varied considerably across the LMICs included in this review, which ranged from 0.06 in Vietnam to 327.65 in Ethiopia.

The review shows the frequent use of unvalidated or unreliable instruments for measuring financial toxicity among cancer patients in LMICs. Unvalidated instruments may generate data that do not contribute to a better understanding of cancer patients' financial difficulties because that data cannot be interpreted effectively. Similar results have been reported by a previous systematic review, which synthesised methods for measuring financial toxicity after cancer diagnosis with most of the included

studies conducted in HICs, such as United States and United Kingdom (48). Few standardised instruments have been developed and validated in an attempt to quantify financial toxicity in cancer patients. Examples of such instruments include Breast Cancer Finances Survey Inventory (49), PFW Scale (10) and COST (9, 50). These tools were developed in HICs and available mostly in these countries where cancer patients' experience of financial toxicity differ from their counterparts in LMICs. Thus, there is a need to develop a simple and cost-effective instrument that is applicable to LMICs.

The limited data in this study does not show clear evidence that health insurance is a determinant of financial toxicity. Data from six studies did not reach statistical significance (19, 34, 36, 38, 42, 43). However, the inclusion of data from China may in part explain this (38). A recent study has demonstrated that government's health insurance coverage significantly increased utilisation of expensive targeted anti-cancer medicines and improved patient's affordability (51). Despite the insufficient data to examine the relationship between health insurance and financial toxicity, it is critical to implement strategies to make health insurance systems sustainable and facilitate access to affordable cancer treatment and care. Previous studies have also highlighted that rural dwellers are less likely to access cancer treatment and care due to the lack of health insurance, travel distance and financial burden (52, 53). Innovative strategies, such as tele-consultation and cancer patient assisted travel schemes can be implemented to reduce rural-urban health inequities by decreasing out-of-pocket costs.

The results from this systematic review and meta-analysis support previous systematic reviews (54-56) and individual studies (7, 8) showing that adult patients with newly diagnosed cancer experience significant financial toxicity and impaired HRQoL. It is important to note that the deteriorating HRQoL occurred in several domains, including physical well-being, social well-being, emotional well-being and functional well-being.

The results of this study show that cancer patients in LMICs often need to finance their medical and non-medical costs by using personal savings, selling assets, skipping bill payments, borrowing or incurring bank debt. Waiving medical bills and implementing social policies that assist with necessities, such as food, accommodation and transport for treatment are critical coping strategies to reduce the financial impact on cancer patients and their families. However, previous studies (57, 58) have reported that most African countries have limited or no social protection systems to provide safety nets for patients, thereby forcing unsustainable coping strategies that increase the risk of bankruptcy.

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Strengths and limitations

Strengths of this study include the comprehensive search strategies, rigorous selection criteria and a thorough review process. This is the first systematic review and meta-analysis to identify the extent of cancer-related financial toxicity and how it has been measured in LMICs. There are limitations in this study. First, substantial heterogeneity in the included studies was detected. Second, it was challenging to explicitly model cost variables and determinants in the meta-analysis due to several reasons, including: incomplete reporting; and the limited number of included studies.

Conclusion

This systematic review and meta-analysis indicates that cancer diagnosis, treatment and care impose high financial toxicity on cancer patients in LMICs. More high-quality research on cancer-related financial toxicity is needed, particularly from Africa. Future research needs to create and validate an instrument that will be available to LMICs to measure financial toxicity in cancer patients.

Declarations

Funding

N/A

Conflicts of interest/Competing interests

The authors declare that they have no conflict(s) of interest.

Ethics approval

This article is based on a secondary analysis of the existing literature and does not contain any studies with human participants or animals performed by any of the authors. The PRISMA guideline for reporting systematic and meta-analysis was followed

Consent to participate

N/A

Consent for publication

N/A

Availability of data and material

All data generated or analysed during this study are included in this published article.

Code availability

N/A

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Authors' contributions

Study protocol and design were developed by AD, VDA-A, FY, ET, DK-M and EKA. All authors contributed to the development of the manuscript. The article search and management were performed by AD. Article screening was completed by ET, EKA and AD. Data extraction was completed by DK-M, FY and AD. Quality assessment and study description were performed by AD and FY. The data analysis was done by AD and consensus discussions and finalising with VDA-A, ET, FY, EKA, DK-M, VV, JY, KAK, SA-S, JK and OK. Table design was completed by AD, DK-M and FY. All authors read and approved the final manuscript.

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Tables

Due to technical limitations Tables 1 and 2 are available as downloads in the Supplementary Files.

Figures

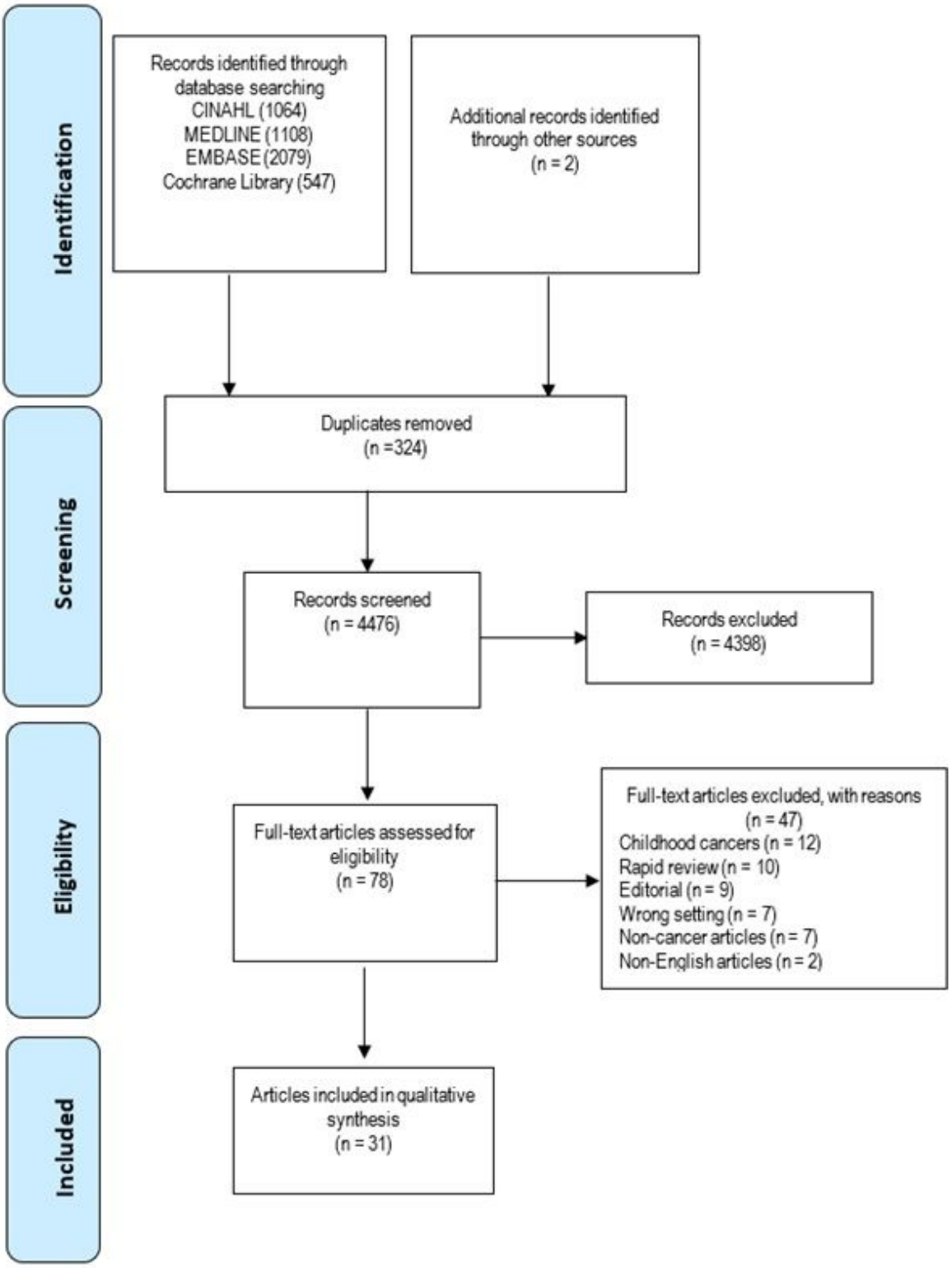

Figure 1

PRISMA flow diagram

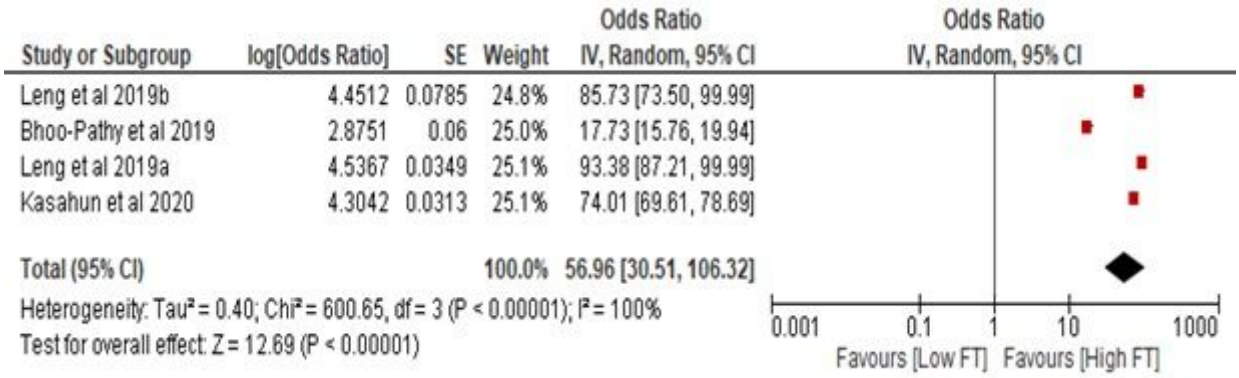

Figure 2

Random-effects meta-analysis of studies that reported the prevalence of financial toxicity

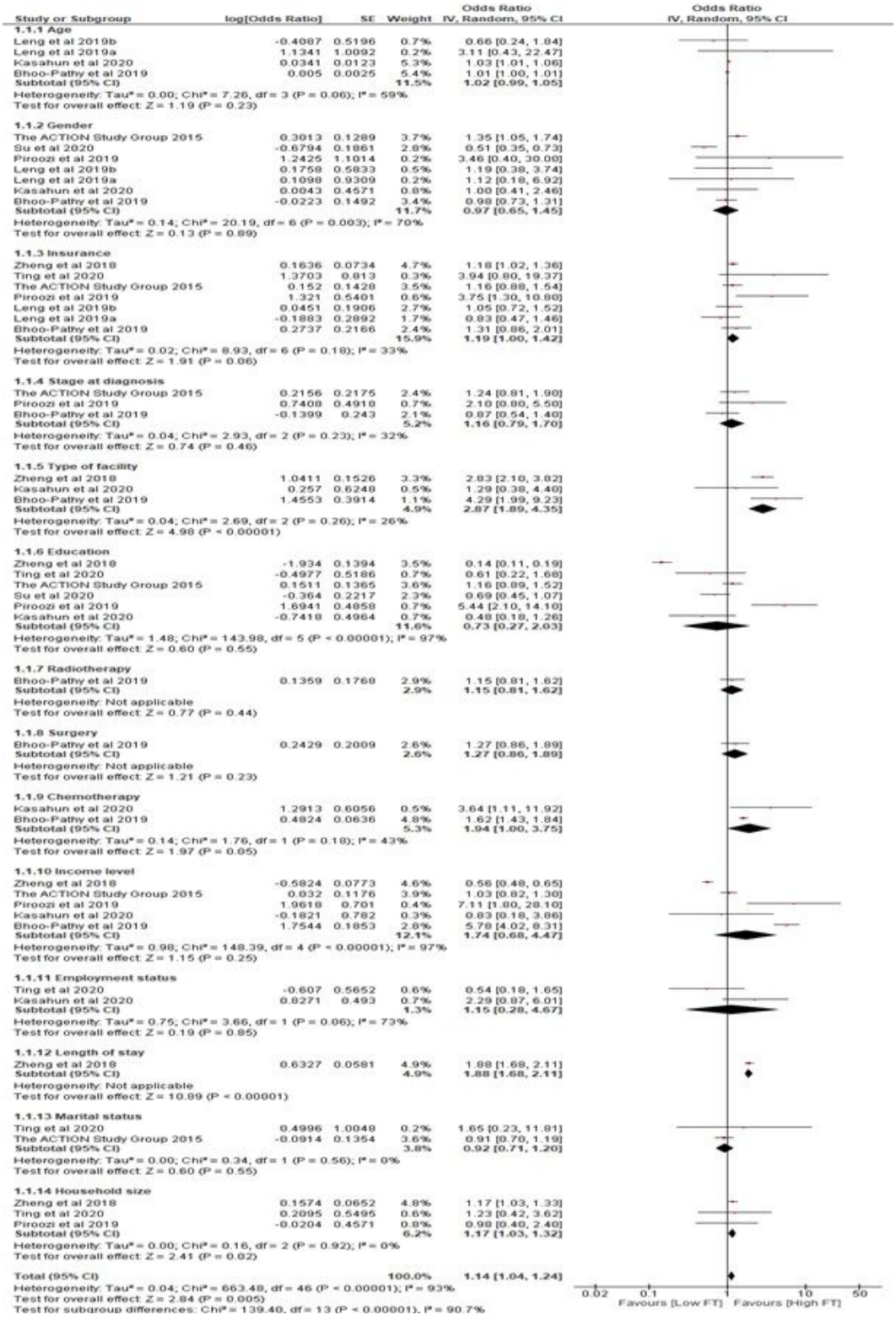

Figure 3

Forest plot showing determinants of cancer-related financial toxicity

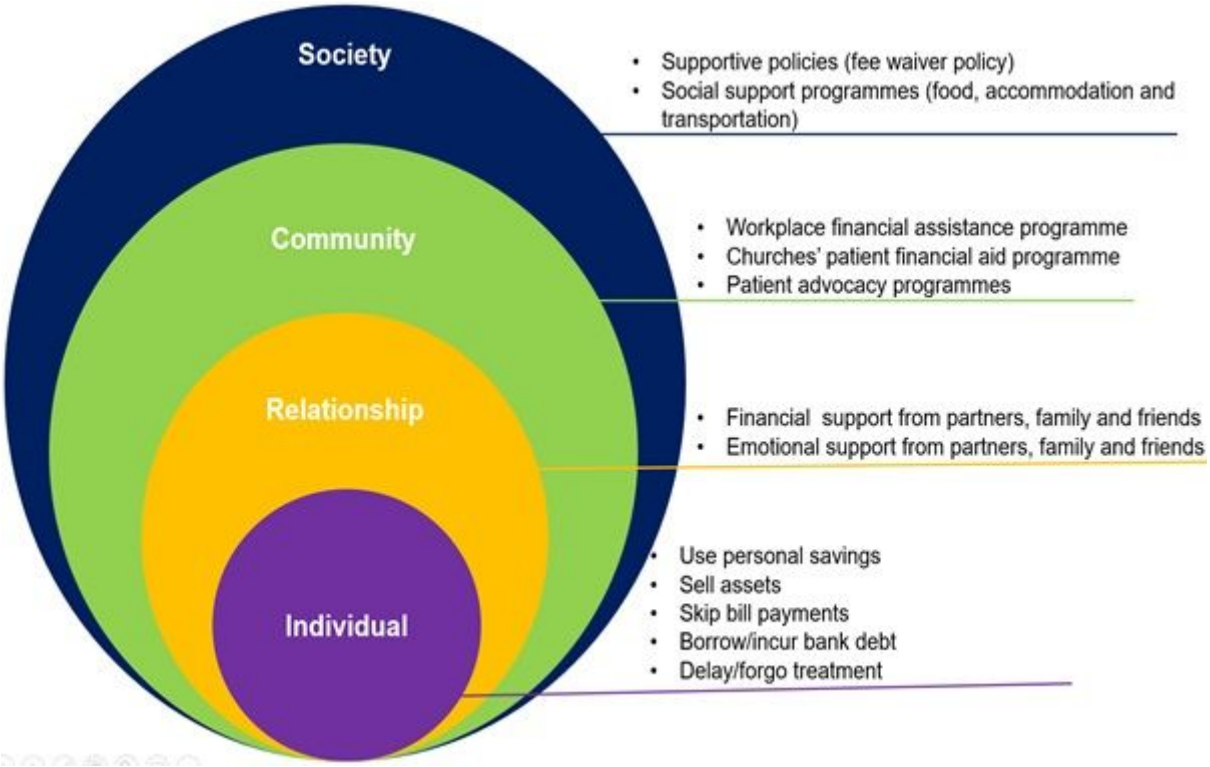

Figure 4

Coping strategies for reducing financial toxicity

Supplementary Files

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- Table1.pdf
- Table2.pdf
- ESM11.pdf
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