Status of financial toxicity and its influence on quality of life in patients with gynecological malignancies in China (#120558)

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Status of financial toxicity and its influence on quality of life in patients with gynecological malignancies in China

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Background . Gynecological malignancies impose a significant health burden on China, accompanied by substantial financial toxicity. High treatment costs create considerable economic strain for patients and their families. These challenges not only decrease treatment adherence but also exacerbate emotional distress and diminish quality of life. This study aims to investigate the extent of financial toxicity experienced by gynecological cancer patients, evaluate its impact on quality of life, and inform the development of targeted clinical interventions. The aim of this study was to investigate the association between financial toxicity and quality of life among patients with gynecological malignancies, thereby providing a basis for the development of strategies to alleviate the adverse impacts of financial toxicity. **Methods** . A convenience sampling approach was employed to recruit 281 patients with gynecological malignancies from two hospitals in Nanjing. A cross-sectional survey was carried out between November 2022 and December 2024. Data were collected using general information questionnaires, the financial toxicity comprehensive scale, and the cancer patient quality-of-life assessment scale. Data entry and management were performed using Excel 2019, and statistical analyses were conducted using SPSS 26.0. **Results** . This study conducted a cross-sectional survey on 281 patients with gynecological malignancies. The data quality was verified through Harman's single-factor test (the first factor's explanatory rate was 30.44%). The results showed that the total economic toxicity score of the patients was (20.80±7.32) and 73% (205/281) had significant economic burdens. Among them, the score of the economic resource dimension was the lowest (3.40±1.37). Multivariate linear regression analysis indicated that the age of children, family per capita monthly income, treatment costs in the past three months,

and marital status were the core influencing factors (adjusted R^2 = 0.310). The overall quality of life of the patients was (65.79±11.39), with lower scores in physiological and emotional states and the total economic toxicity score was significantly positively correlated with quality of life (r =0.553, P <0.01). The sample characteristics showed that the average age of the patients was (52.27±10.78) years old, cervical cancer accounted for the highest proportion (49.5%), 29.2% were unemployed or resigned due to the disease and 96.8% had medical expenditures exceeding 5,000 yuan in the past three months. Conclusion . The majority of studied patients experienced financial toxicity, with financial status, family dynamics, and widowhood being key influencing factors.

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Abstract

Background. Gynecological malignancies impose a significant health burden on China, accompanied by substantial financial toxicity. High treatment costs create considerable economic strain for patients and their families. These challenges not only decrease treatment adherence but also exacerbate emotional distress and diminish quality of life. This study aims to investigate the extent of financial toxicity experienced by gynecological cancer patients, evaluate its impact on quality of life, and inform the development of targeted clinical interventions. The aim of this study was to investigate the association between financial toxicity and quality of life among patients with gynecological malignancies, thereby providing a basis for the development of strategies to alleviate the adverse impacts of financial toxicity.

Methods. A convenience sampling approach was employed to recruit 281 patients with gynecological malignancies from two hospitals in Nanjing. A cross-sectional survey was carried out between November 2022 and December 2024. Data were collected using general information questionnaires, the financial toxicity comprehensive scale, and the cancer patient quality-of-life assessment scale. Data entry and management were performed using Excel 2019, and statistical analyses were conducted using SPSS 26.0.

Results. This study conducted a cross-sectional survey on 281 patients with gynecological malignancies. The data quality was verified through Harman's single-factor test (the first factor's explanatory rate was 30.44%). The results showed that the total economic toxicity score of the patients was (20.80±7.32) and 73% (205/281) had significant economic burdens. Among them, the score of the economic resource dimension was the lowest (3.40±1.37). Multivariate linear regression analysis indicated that the age of children, family per capita monthly income, treatment costs in the past three months, and marital status were the core influencing factors (adjusted $R^2 = 0.310$). The overall quality of life of the patients was (65.79±11.39), with lower scores in physiological and emotional states and the total economic toxicity score was significantly positively correlated with quality of life (r=0.553, P<0.01). The sample characteristics showed that the average age of the patients was (52.27±10.78) years old, cervical cancer accounted for the highest proportion (49.5%), 29.2% were unemployed or resigned due to the disease and 96.8% had medical expenditures exceeding 5,000 yuan in the past three months.

Conclusion. The majority of studied patients experienced financial toxicity, with financial status, family dynamics, and widowhood being key influencing factors.

Keywords. Gynecologic malignancy; Financial toxicity; Quality of life; Cross-sectional study; Correlation study

Introduction

Globally, gynecological malignancies, including cervical, ovarian, and endometrial cancers, constitute a significant public health challenge (Xu et al. 2024). According to GLOBOCAN statistics (Sung et al. 2021), the number of patients with cervical cancer, ovarian cancer and endometrial cancer worldwide exceeded 1.33 million in 2020. In China, the number of new cases is approximately 170,000. Gynecological malignancies account for 12.5% of new cases of malignant tumors among women and 11.2% of the total number of female deaths. While advancements in medical science have indeed improved survival rates and therapeutic efficacy for gynecological cancers, these advancements are associated with a significant increase in financial costs, encompassing a wide range of expenditures including medications, surgeries, radiation therapy, chemotherapy, and post-treatment care.

Studies (Kale & Carroll 2016; Zafar & Abernethy 2013) have pointed out that the reduced income and treatment-related financial expenses of cancer patients directly or indirectly affect their quality of life and mental health, this issue is especially poignant, as the burden transcends physical afflictions to encompass a formidable economic challenge labeled "financial toxicity". It encapsulates the extensive financial strain and psychological distress imposed on patients and their families by the exorbitant costs associated with cancer care (Abrams et al. 2021). The repercussions extend beyond immediate monetary expenses, often precipitating financial hardship and, in severe cases, impoverishment, which can critically influence subsequent treatment choices and daily living arrangements (Banegas et al. 2016). A research report on breast cancer patients stated that the average monthly loss of income and OOP expenses was $1,455(Jagsi et al. 2014). In another study, approximately 12% of breast cancer patients reported medical debt four years after diagnosis (Ramsey et al. 2013).

Financial toxicity infiltrates the psycho-emotional domain, exacerbating psychological distress, fostering conditions like depression and anxiety, and eroding overall life satisfaction and happiness, thereby exacting a profound toll on patients' quality of life (QoL) (Ver Hoeve et al. 2021). Presently, the research landscape surrounding financial toxicity among gynecological cancer patients remains underexplored, particularly concerning the intricate interplay among financial burdens, social support networks, coping mechanisms, and their collective impact on QoL. Understanding these relationships is further compounded by the necessity to recognize the differential experiences across diverse geographic regions, economic strata, and cultural backgrounds, where varying levels of economic pressure and coping strategies may yield distinct outcomes.

This study, therefore, endeavors to delve into the contemporary status of economic hardship faced by gynecological malignancy patients, examining meticulously the specific ways in which financial toxicity impinges on their QoL. By identifying pivotal influencing factors and regulatory mechanisms, this investigation aims to contribute to the formulation of targeted financial aid policies, psychological support interventions, and optimized allocation of healthcare resources. Ultimately, the aspiration is to alleviate the economic strain on patients, enhancing

116 their overall health and QoL, thereby addressing a crucial lacuna in the current understanding
117 and management of financial toxicity within this patient population.

Materials & Methods

Participant

120 The study has been approved by the ethics committee of Women's Hospital of Nanjing Medical
121 University (Nanjing Women and Children's Healthcare Hospital) 2021KY-113. This study
122 recruited 281 patients with cervical, ovarian, or endometrial cancer who were treated at one of
123 two tertiary-level hospitals in Nanjing between November 2022 and December 2024 as study
124 participants. The inclusion criteria for this study were as follows: (1) patients diagnosed with
125 cervical, ovarian, or endometrial cancer based on histopathological examination; (2) individuals
126 aged 18 years or older; (3) those who had initiated treatment, which may include surgery,
127 chemotherapy, or radiotherapy; (4) participants capable of completing the questionnaire
128 independently or with assistance from the researcher; and (5) individuals who voluntarily
129 provided informed consent to participate in the study. Exclusion criteria included patients with
130 comorbid psychiatric disorders or cognitive impairments, as well as those receiving protective
131 medical treatments or unable to communicate effectively due to hearing or speech disorders. The
132 sample size was determined using G*Power 3.1 software. Based on the requirements of multi-
133 factor analysis (Faul et al. 2009), with a medium effect size (f^2=0.15), α= 0.05 and test power (1-
134 β) =0.90. Considering 29 independent variables in this study, the required sample size was
135 calculated to be at least 223 cases. Accounting for potential unqualified samples and expanding
136 by 15%, the final sample size for this study was set at 257 participants.

Demographic and clinical data

138 Demographic and clinical data on enrolled participants were collected by reviewing medical
139 records and interviewing patients, including demographic information such as age, marital status,
140 occupation, location, income, companion, health insurance and whether or not they traveled to a
141 different location for medical care, and information related to disease characteristics such as
142 pathological diagnosis, duration of the disease, number of hospitalizations, whether or not they
143 had metastasized, whether or not they had relapsed, chronic diseases, treatment modalities, and
144 complications.

Assessment of financial toxicity

146 The Comprehensive Score for Financial Toxicity (COST) evaluates the level of financial toxicity
147 experienced by patients. This scale was developed by Jonas scholars in the United States in 2014
148 and has since been widely utilized to assess financial toxicity among cancer patients both
149 domestically and internationally (Bouberhan et al. 2019). The instrument comprises a total of 11
150 items that encompass three dimensions: psychosocial responses, economic expenditures, and
151 income. It demonstrates a high internal consistency with a Cronbach's α coefficient of 0.9. Each
152 item is rated on a five-point Likert scale as follows: "not at all (0)," "a little (1)," "some (2),"
153 "quite a lot (3)," and "very much (4)." In 2017, Yu et al. (Yu et al. 2017) adapted this scale for
154 use in China; their findings indicated that the Chinese version of the Comprehensive Financial
155 toxicity Rating Scale possesses good reliability and structural validity, with a Cronbach's α

156 coefficient of 0.889, making it suitable for application within the Chinese cancer population. In
157 this study, the Cronbach's α coefficient for this scale was found to be 0.892.

Assessment of QOL

159 The Functional Assessment of Cancer Therapy-Generic Scale (FACT-G) was developed by the
160 Center for Outcome Research and Education at Northwestern University (Cella et al. 1993).
161 FACT-G is a widely utilized instrument designed to assess the overall quality of life in cancer
162 patients. The fourth edition of FACT-G comprises 27 items, categorized into four dimensions:
163 physical well-being (7 items), social/family well-being (7 items), emotional well-being (6 items),
164 and functional well-being (7 items). Each item is rated on a five-point Likert scale ranging from
165 0 to 4, corresponding to the responses "not at all," "somewhat," "moderately," "quite a bit," and
166 "very much." The total score for each dimension contributes to an overall score, with higher
167 scores indicating better quality of life. The Chinese version of FACT-G (Wan et al. 2006) has
168 demonstrated effective applicability among cancer patients in China and has been extensively
169 employed in research. In this study, Cronbach's α coefficient for this scale was found to be 0.868.

Data collection

171 After obtaining approval from the Institutional Ethical Review Board for Medical Research, data
172 were collected by the researcher using a structured questionnaire. A convenience sampling
173 approach was utilized to recruit study participants in strict accordance with the predefined
174 inclusion and exclusion criteria. Prior to distributing the questionnaires, the purpose and
175 significance of the study were clearly explained to all potential participants. Written informed
176 consent was obtained from each participant before proceeding. Questionnaires were then
177 distributed on-site, accompanied by detailed instructions for uniform completion. For
178 participants with limited literacy or those unable to complete the questionnaire independently
179 due to health conditions, the researcher administered the questionnaire orally, reading each item
180 aloud and recording responses verbatim based on their selections. All completed questionnaires
181 were collected and immediately verified for completeness and accuracy.

Statistical analysis

183 Data entry and sorting were performed using Excel 2019 software, while statistical analyses were
184 conducted using SPSS 26.0 software. Statistical significance was assessed based on two-tailed P-
185 values, with a threshold of $p<0.05$ considered statistically significant. Sociodemographic and
186 clinical characteristics were described using frequencies and percentages, whereas scale scores
187 were summarized using means and standard deviations. For univariate analysis, t-tests or
188 ANOVA were employed as appropriate. Multivariable analyses were performed using multiple
189 linear regression or logistic regression models. Pearson correlation analysis or Spearman rank
190 correlation analysis was utilized to evaluate the relationships between financial toxicity and
191 quality of life in patients with gynecologic malignancies.

Results

Common method bias analysis

194 In this study, data were collected through self-report measures. To assess the objectivity of the
195 data, Harman's single-factor test (Kock 2022) was employed for exploratory factor analysis. The
196 results indicated that the variance explained by the first factor was 30.437%, which is below the

197 critical threshold of 40%. This finding suggests that there is no significant common method bias
198 present in this study.

Social demographics

200 A total of 290 questionnaires were distributed in this study. After excluding the invalid
201 responses, 281 valid questionnaires were collected, resulting in an effective recovery rate of
202 96.9%. The participants included 281 patients diagnosed with gynecological malignancies, aged
203 between 21 and 75 years, with a mean age of 52.27 (SD=10.78) years. The largest proportion of
204 patients (52.7%) fell within the age range of 45 to 60 years. Among the respondents, there were
205 139 cases of cervical cancer (49.5%), 65 cases of endometrial cancer (23.1%), and 77 cases of
206 ovarian cancer (27.4%). 54.45% of the people have a family member income of less than 5,000
207 yuan per month. 96.8% of patients spent more than 5,000 yuan on medical expenses in the first
208 three months. For further details refer to Table 1 and Table 2.

Comparison of financial toxicity

210 In this study, the average COST score for patients with gynecological malignancies ranged from
211 0 to 40 points, with a mean total score of 20.80 (SD=7.32) points. The average score for the
212 economic expenditure dimension was 2.07 (SD=0.96) points, while the average score for the
213 economic resources dimension was 3.40 (SD=1.37) points. Additionally, the average score for
214 the psychosocial response dimension was 15.33 (SD=5.81) points. Among the 281 patients
215 diagnosed with gynecological malignancies, 205 patients had a COST score <26, indicating
216 financial toxicity (See Table 3).

Single factor analysis of financial toxicity in patients with gynecological malignancies

218 The analysis results of this study indicate that various factors, including age, place of residence,
219 marital status, occupation, the impact of disease on work, children's ages, family per capita
220 monthly income, medical insurance, commercial insurance, escort, access to medical treatment
221 in different locations, treatment costs incurred over the last three months, disease diagnosis and
222 pathological stage, course of the disease (including metastasis and recurrence), surgical methods
223 employed (such as chemotherapy and molecular targeted therapy), as well as whether or not any
224 treatment was received, all significantly influenced the financial toxicity score among patients
225 with gynecological malignancies (P<0.05). The specific results are shown in Table 4.

**Multivariate linear regression analysis of influencing factors of financial toxicity in
patients with gynecological malignancies**

228 In this study, the total financial toxicity score of patients with gynecological malignancies was
229 designated as the dependent variable. Statistically significant variables, including age, place of
230 residence, marital status, occupation, impact of disease on work, age of children, per capita
231 monthly family income, medical insurance coverage, pension insurance status, presence of
232 caregivers, whether patients sought medical treatment in different locations, treatment costs
233 incurred over the last three months, disease diagnosis and pathological stage, duration of illness
234 course, presence or absence of metastasis and recurrence, surgical modality employed and
235 receipt of chemotherapy were included in univariate analysis. Additionally examined were
236 whether patients received molecular targeted therapy and the number of hospitalizations as
237 independent variables. Multiple linear regression analysis revealed that children's age; family per

238   capita monthly income; treatment costs from the past three months; and marital status
239   significantly influenced financial toxicity among patients with gynecologic malignancies
240   ($P<0.05$), as detailed in Table 5. These factors accounted for 31.0% of the variation in financial
241   toxicity observed in this patient population (adjusted $R^2 = 0.310$).

242   Correlation analysis of financial toxicity level and quality of life in gynecological
243   malignant tumor patients

244   The analysis results showed that the total score of quality of life of patients with gynecological
245   malignant tumor was 65.79 (SD=11.39) points, the score of physiological status dimension was
246   17.52 (SD=4.04) points, the score of social and family status was 21.75 (SD=3.78) points and the
247   score of emotional status was 14.20 (SD=4.06) points. Functional status scores were 12.32
248   (SD=4.54) points. Pearson correlation analysis showed that quality of life was positively
249   correlated with total financial toxicity (r=0.553, $P<0.01$). See details in Table 6.

250   Discussion

251   Status of financial toxicity in patients with gynecological malignancies

252   The results of this study demonstrated that the financial toxicity score among patients with
253   gynecologic malignant tumors was 20.80 ($SD = 7.32$), and approximately 73% of these patients
254   experienced financial toxicity. The study conducted by Bouberhan revealed that 31.6% of
255   patients with gynecological malignancies experienced financial toxicity (Bouberhan et al. 2019),
256   while Liang (Liang et al. 2020) reported that approximately 53.7% of patients with
257   gynecological cancer faced high levels of financial toxicity. The findings of the present study are
258   relatively higher, indicating that patients with gynecological malignancies in China may be more
259   vulnerable to financial toxicity. Consideration may be related to sociodemographic
260   characteristics. The survey site of Yuan and other scholars is Xuhui District of Shanghai, which
261   has more developed economy, higher per capita income, and stronger resistance to financial
262   toxicity of patients. The mean age of the study subjects was 63.40 (SD=10.33) years, which is
263   significantly higher than that of another group of study subjects whose mean age was 52.27
264   (SD=10.78) years. Older patients may have accumulated greater savings, thereby enhancing their
265   capacity to mitigate financial toxicity. Furthermore, this phenomenon might also be linked to the
266   type of disease. Previous studies have indicated that the hospitalization cost for breast cancer is
267   significantly lower than that for ovarian cancer (Esselen et al. 2021b), which could potentially
268   explain the observed differences in outcomes. The treatment of gynecological malignant tumor is
269   a long and repeated process. As the disease progresses, treatment costs continue to accumulate,
270   leading to financial toxicity among patients. This highlights the importance of early-stage
271   financial toxicity screening for patients with gynecological malignancies by medical staff.
272   Discussions regarding treatment costs should be initiated with high-risk groups, and medical
273   insurance-related knowledge should be disseminated. Additionally, assisting patients in building
274   psychological expectations and understanding reimbursement ratios can help reduce adverse
275   coping behaviors, thereby improving treatment compliance and enhancing patients' quality of
276   life.

277   Factors influencing financial toxicity in patients with gynecological malignant tumor

278   The results suggest that the age of children, the monthly income per capita in the family, the cost
279   of treatment in the last three months and the widowhood are the influencing factors of financial
280   toxicity in patients with gynecological malignancies.

281   *Children age*

282   According to the results of this study, there was a statistically significant difference in financial
283   toxicity among patients with gynecological malignant tumors based on their children's age.
284   Specifically, patients with older children exhibited lower levels of financial toxicity, whereas
285   those with younger children experienced higher financial toxicity. For patients with
286   gynecological malignancies, adult and economically independent children can directly share
287   medical expenses, thereby alleviating the economic burden. Moreover, the daily care provided
288   by these children can positively influence the physical and mental health of patients, jointly
289   mitigating financial toxicity from two perspectives. Conversely, younger children require more
290   time, energy, and financial investment from the patient. In the context of high treatment costs,
291   patients with younger children must also bear the additional economic pressure of parenting,
292   leading to a heavier overall financial burden and increased susceptibility to the adverse effects of
293   financial toxicity and parenting concerns (Jewett et al. 2024). These findings indicate that
294   nursing staff should fully leverage the intergenerational support role of children and develop
295   family-centered intervention strategies.

296   *Family per capita monthly income*

297   This study revealed that as family per capita income increases, the financial toxicity experienced
298   by patients with gynecological malignancies decreases. These findings align with previous
299   studies (Esselen et al. 2021a; Qiu et al. 2023; Zeybek et al. 2021), which highlight that low-
300   income patients are more vulnerable to financial toxicity. Research has shown that low-income
301   patients exhibit reduced compliance in early screening, timely diagnosis and treatment, and
302   continuity of care (Nnaji et al. 2022). As a result, they are more likely to become trapped in a
303   vicious cycle characterized by "disease-increased expenditure-adverse coping behaviors-
304   deterioration of health outcomes-decreased income-financial toxicity" (Carrera et al. 2018). It is
305   recommended that nursing staff provide tailored suggestions based on patients' varying economic
306   conditions. Furthermore, efforts should focus on enhancing health education for low-income
307   patients diagnosed with gynecological malignancies. Providing information about treatment costs
308   and available economic resources can encourage these patients to actively participate in their
309   treatment plans, potentially reducing complications and alleviating the impact of financial
310   toxicity.

311   *Treatment costs in the past three months*

312   In the last three months of treatment for patients with gynecological malignancies, statistically
313   significant differences in financial toxicity were observed. The results suggest that higher
314   treatment costs during this period are associated with increased financial toxicity scores among
315   these patients, whereas lower costs correspond to reduced financial toxicity. This finding
316   contrasts with the research reported by previous studies (Chatterjee et al. 2017; Jordan et al.
317   2020). One potential explanation for the observed discrepancy could be attributed to variations in
318   treatment cost structures between the current study and prior studies. In this study, treatment

319   costs over the last three months were classified into three categories. Notably, 96.8% of patients
320   reported treatment costs exceeding 5000 yuan during this period. Only one patient incurred
321   expenses within the range of 1001 to 2999 yuan, while eight patients fell within the range of
322   3000 to 4999 yuan for their final three months of treatment. Nevertheless, the financial burden
323   associated with the clinical management of gynecological malignancies remains relatively
324   significant, often measured in units of "ten thousand yuan." This discrepancy may introduce bias
325   into the results, thus requiring further validation in subsequent studies.

326   *Widow*

327   The findings of this study reveal that widowed patients with gynecologic malignancies
328   experience greater financial toxicity compared to their married counterparts. This observation is
329   consistent with the results reported by Benedict et al. (Benedict et al. 2022), who found that
330   single patients with breast cancer and gynecologic malignancies also encounter heightened
331   financial toxicity. Prior research (Lloyd-Sherlock et al. 2015) has shown that widowed women
332   often have lower socioeconomic status and are at higher risk of poverty, particularly in
333   developing countries. For these individuals, limited financial resources make it difficult to
334   effectively manage emergencies such as a diagnosis of gynecologic malignancies. Moreover,
335   they frequently lack the emotional and practical support typically provided by spouses, which
336   increases their vulnerability to depression and economic strain, thereby contributing to a reduced
337   quality of life (Liang et al. 2020; Marano & Mazza 2024). However, it should be noted that only
338   two patients with gynecologic malignancies in this study reported spousal loss; therefore, further
339   investigation is necessary to validate these findings.

340   **Correlation between financial toxicity and quality of life in patients with gynecological**
341   **malignancies**

342   The correlation analysis results of this study revealed a significant positive relationship between
343   the financial toxicity score and the quality of life among patients with gynecological
344   malignancies (r=0.553, P<0.01). Specifically, higher levels of financial toxicity were associated
345   with a lower quality of life for these patients. Studies have demonstrated that 33% to 83% of
346   patients with gynecological malignancies (e.g., ovarian cancer, endometrial cancer) experience
347   financial toxicity, and 58% of these patients bear a substantial financial burden, which is directly
348   associated with a decline in their quality of life (Bouberhan et al. 2019; Kajimoto et al. 2022;
349   Zeybek et al. 2021). 66% of patients experience depression or anxiety due to financial stress, and
350   the quality of life scores of patients with severe financial toxicity are significantly lower than
351   those with no/mild financial burden (Smith et al. 2014). Patients may reduce leisure activities,
352   cut basic expenses and even use savings or borrow money, exacerbating the family's financial
353   difficulties (Zafar et al. 2013). The impact of financial toxicity on patients' quality of life is
354   complex and multidimensional, varying according to disease type, modes of financial burden,
355   and patients' socioeconomic backgrounds (de la Cruz & Delgado-Guay 2021; Delgado-Guay et
356   al. 2015b; Semin et al. 2020). Economically toxic patients are more likely to delay medical
357   treatment and forgo treatment. For example, patients with severe financial hardship are at a five-
358   fold increased risk of drug non-adherence and are more likely to discontinue treatment due to
359   cost issues. This non-adherence further leads to worsening symptoms and reduced survival (de la

360 Cruz & Delgado-Guay 2021; Nogueira et al. 2020; Zeybek et al. 2021). The association between
361 financial toxicity and a decline in quality of life is more significant among low - income patients,
362 and existing assessment tools (such as the COST scale) may not fully capture their financial
363 distress (Petruzzi et al. 2023). This study identified a bidirectional reinforcing relationship
364 between financial stress and mental health. Quantitative analyses indicate that 29% of patients
365 experiencing moderate to severe financial toxicity also present depressive symptoms, while 36%
366 suffer from anxiety disorders (Chen et al. 2022; Zhao et al. 2024). This psychological distress,
367 compounded by physical symptoms such as fatigue and pain, establishes a vicious cycle that
368 contributes to a reduction in social functioning scores (Delgado-Guay et al. 2015a).

Conclusions

370 The financial burden associated with gynecological malignancies in China is substantial, with
371 73% of patients experiencing moderate or higher levels of economic toxicity. This finding
372 underscores the gaps within the current prevention and control system for disease-related
373 economic risks. Economic toxicity exhibits multi-dimensional socio-demographic
374 characteristics, with vulnerabilities in family structures, low income levels, and high short-term
375 treatment costs identified as core risk factors. These elements indicate that financial toxicity
376 fundamentally stems from a combination of inadequate family economic resilience and the
377 financial strain imposed by medical expenses. The novelty of this study lies in addressing
378 research gaps related to financial toxicity within the field of gynecological oncology in China,
379 establishing a localized evaluation framework, and providing an empirical foundation for
380 developing stratified intervention strategies. However, due to the inherent limitations of a single-
381 center cross-sectional design, caution is warranted when generalizing these findings. Future
382 research should focus on creating multi-center longitudinal cohorts that incorporate mediating
383 variables such as medical payment methods and social support networks to enable a more in-
384 depth analysis of the dynamic evolution of financial toxicity and its pathways influencing quality
385 of life.

Authors' contributions

389 Zhen Hong and Wanhong Wei were responsible for the project design and formal analysis. Lei
390 Zhang and Yu Zhang wrote the main manuscript. Sijing Chen and Jingjing Zhang were
391 responsible for data curation. Minmin Song and Mingming Hu were prepared Tables. Lin Liu,
392 Ying Kong and Lingling Tang guided writing and commented and revised manuscripts.

Availability of data and materials

399 Data are available upon reasonable request from the corresponding author.

400 **Declarations**

401 *Ethnics approval and consent to participate*

402 The study has been approved by the ethics committee of Women's Hospital of Nanjing Medical
403 University (Nanjing Women and Children's Healthcare Hospital) 2021KY-113 and written
404 informed consent from every participant was obtained before the investigation.

405 *Consent for publication*

406 Not applicable.

407 *Competing interests*

408 The authors declare that there are no conflicts of interest.

409

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Table 1(on next page)

Table 1 Basic characteristics of patients with gynecological malignancies

1

Table 1　Basic characteristics of patients with gynecological malignancies（n=281）

Variables	Groups	Total（n）	%
Age	18～30	8	2.8
	31～44	66	23.5
	45～60	148	52.7
	＞60	59	21.0
Ethnicity	Han	278	98.9
	Ethnic minorities	3	1.1
Place of residence	City	145	51.6
	County/town	41	14.6
	Rural/suburban	95	33.8
Marital status	Married	270	96.1
	Single	3	1.1
	Divorced	6	2.1
	Widowed	2	0.7
Occupation	Farmers/Fishermen	21	7.5
	Worker/Waiter	41	14.6
	Individual household	45	16.0
	Professional Technical/administrative Personnel	56	19.9
	Retire	85	30.2
	Wait for employment	17	6.0
	Dimission	16	5.7
The impact of illness on work	Have no effect	196	69.8
	Early retirement	3	1.1
	Unemployment/resignation	82	29.2
Educational	Never went to school	28	10.0

Status	Primary school	49	17.4
	Junior high school	98	34.9
	High school/technical secondary school	50	17.8
	Junior college	27	9.6
	Bachelor degree or above	29	10.3
Number of children	None	13	4.6
	1	167	59.4
	2	87	31.0
	3	9	3.2
	4	4	1.4
	5	1	0.4
Children's age	0~6	15	5.3
	7~17	38	13.5
	18~24	46	16.4
	>24	169	60.1
Family per capita monthly income	≤1000	9	3.2
	1001-2999	41	14.6
	3000-4999	103	36.7
	≥5000	128	45.6
Medical insurance	Self-financing	11	3.9
	Medical insurance for urban workers	111	39.5
	Medical insurance for urban and rural residents	159	56.6
Commercial insurance	No	278	98.9
	Yes	3	1.1
Receive subsidy	No	265	94.3
	Yes	16	5.7
Endowment	No	53	18.9

insurance	Yes	228	81.1
Escort	None	2	0.7
	Hubby	208	74.0
	Sons and daughters	48	17.1
	Parent	8	2.8
	Relatives and friends	12	4.3
	Others	3	1.1
Medical treatment in different locations	No	182	64.8
	Yes	99	35.2
How long it takes to get to the hospital	<2 hours	24	8.9
	2-5 hours	70	24.9
	>5 hours	5	1.8
Treatment costs in the last three months	1001-2999	1	0.4
	3000-4999	8	2.8
	≥5000	272	96.8

2

Table 2(on next page)

Table 2 Clinical characteristics of study population

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2

Table 2 Clinical characteristics of study population （n=281）

Variables	Groups	Total （n）	%
Disease diagnosis	Cervical cancer	139	49.5
	Endometrial cancer	65	23.1
	Ovarian cancer	77	27.4
Pathological stage	Stage I	114	40.6
	Stage II	74	26.3
	Stage III	83	29.5
	Stage IV	10	3.6
Course of disease	＜3 months	212	75.4
	3-6 months	40	14.2
	6-12 months	13	4.6
	＞12 months	16	5.7
Metastasis or not	No	232	82.6
	Yes	49	17.4
Relapse or not	No	262	93.2
	Yes	19	6.8
Complicated chronic disease	None	195	69.4
	1	74	26.3
	2	12	4.3
Mode of operation	No	8	2.8
	Laparotomy	136	48.4
	Laparoscopic surgery	137	48.8
chemotherapy	No	122	43.4
	Yes	159	56.6
radiotherapy	No	245	87.2

	Yes	36	12.8
Biological immunotherapy	No	278	98.9
	Yes	3	1.1
Molecular targeted therapy	No	274	97.5
	Yes	7	2.5
TCM (traditional Chinese medicine) therapy	No	278	98.9
	Yes	3	1.1
Supportive treatment	No	279	99.3
	Yes	2	0.7
hospitalizations	1-2	138	49.1
	3-5	83	29.5
	6-10	37	13.2
	$\geqslant 10$	23	8.2
Complication	No	141	50.2
	Yes	140	49.8

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Table 3(on next page)

Table 3 COST Score of patients with gynecological malignant tumors

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Table 3 COST Score of patients with gynecological malignant tumors

COST Score	Total（n）	%
≥26	76	27.0
14~25	163	58.0
1~13	41	14.6
0	1	0.4

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Table 4(on next page)

Table 4 Single factor analysis of financial toxicity in patients with gynecological malignant tumors

1 **Table 4 Single factor analysis of financial toxicity in patients with gynecological**
2 **malignant tumors**

Variables	Groups	Total(n)	COST score	t/F	P
Age	18～30	8	11.88±6.38	9.227	＜
					0.001
	31～44	66	19.42±6.55		
	45～60	148	20.64±7.51		
	＞60	59	23.98±6.26		
Ethnicity	Han people	278	20.73±7.29	-1.557	0.121
	Ethnic minorities	3	27.33±9.07		
Wohnort	City	145	22.83±6.75	14.75	＜
				5	0.001
	County/town	41	20.51±6.95		
	Rural/suburban	95	17.83±7.35		
Marriage	Married	270	21.01±7.17	4.744	0.003
	Single	3	6.67±3.06		
	Divorced	6	21.00±8.85		
	Widowed	2	13.00±7.07		
Occupation	Farmers/Fishermen	21	17.86±9.15	6.987	＜
					0.001
	Worker/Waiter	41	18.34±7.46		
	Individual household	45	20.82±5.39		
	Professional Technical/administrative Personnel	56	22.05±6.65		
	Retire	85	23.66±6.47		
	Wait for	17	17.88±7.96		

	employment				
	Dimission	16	14.50±7.67		
The impact of illness on work	Have no effect	196	22.36±6.83	16.223	< 0.001
	Early retirement	3	18.67±14.04		
	Unemployment/resignation	82	17.17±6.98		
Educational Status	Never went to school	28	18.93±6.59	1.730	0.128
	Primary school	49	18.92±8.95		
	Junior high school	98	21.00±6.77		
	High school/technical secondary school	50	21.54±6.33		
	Junior college	27	22.89±8.43		
	Bachelor degree or above	29	21.93±6.77		
Number of children	None	13	19.15±10.34	1.211	0.304
	1	167	21.14±7.21		
	2	87	19.84±7.25		
	3	9	23.67±4.64		
	4	4	24.75±5.12		
	5	1	28.00		
Age of Children	0~6	15	16.07±6.54	4.106	0.007
	7~17	38	19.08±6.55		
	18~24	46	20.65±7.52		
	>24	169	21.78±7.05		

Per capita monthly household income	≤1000	9	14.67±7.65	15.197	<0.001
	1001-2999	41	15.46±7.22		
	3000-4999	103	20.75±6.56		
	≥5000	128	22.99±6.84		
Medical insurance	Self-financing	11	16.73±10.05	11.269	<0.001
	Medical insurance for urban workers	111	23.20±6.52		
	Medical insurance for urban and rural residents	159	19.42±7.20		
Commercial insurance	No	278	20.77±7.35	-0.839	0.402
	Yes	3	24.33±2.31		
Receive subsidy	No	265	20.91±7.30	0.944	0.346
	Yes	16	19.13±7.67		
Endowment insurance	No	53	16.72±8.47	-4.677	<0.001
	Yes	228	21.75±6.70		
Escort	None	2	14.50±0.71	2.522	0.030
	Hubby	208	20.45±6.76		
	Sons and daughters	48	23.40±8.48		
	Parent	8	16.00±8.86		
	Relatives and friends	12	20.00±7.32		
	Others	3	24.33±13.65		
Medical treatment	No	182	21.79±7.24	3.111	0.002

in different places	Yes	99	18.99±7.17		
How long it takes to get to the hospital	<2 hours	25	19.28±7.16	0.372	0.691
	2-5 hours	70	19.00±6.81		
	>5 hours	5	21.80±9.52		
Treatment costs in the last three months	1001-2999	1	14.00	3.574	0.029
	3000-4999	8	14.50±8.30		
	≥5000	272	21.01±7.23		
Disease diagnosis	Cervical cancer	139	21.33±6.89	4.588	0.011
	Endometrial cancer	65	22.12±7.02		
	Ovarian cancer	77	18.74±7.97		
Pathological stage	Stage I	114	21.75±6.81	9.278	<0.001
	Stage II	74	23.12±6.81		
	Stage III	83	18.02±7.40		
	Stage IV	10	16.00±7.70		
Course of disease	<3 months	212	21.27±7.22	3.132	0.026
	3-6 months	40	21.10±6.42		
	6-12 months	13	18.00±7.86		
	>12 months	16	16.19±8.88		
Metastasis or not	No	232	21.74±6.73	4.199	<0.001
	Yes	49	16.37±8.41		
Relapse or not	No	262	21.16±7.09	3.106	0.002
	Yes	19	15.84±8.80		
Complicated chronic disease	None	195	20.19±7.49	2.302	0.102
	1	74	22.28±6.93		
	2	12	21.67±5.93		

Mode of operation	No	8	14.75±10.11	6.636	0.002
	Laparotomy	136	19.79±7.50		
	Laparoscopic surgery	137	22.16±6.65		
chemotherapy	No	122	22.98±6.74	4.501	< 0.001
	Yes	159	19.14±7.33		
radiotherapy	No	245	20.94±7.26	0.803	0.423
	Yes	36	19.89±7.78		
Biological immunotherapy	No	278	20.82±7.24	0.349	0.727
	Yes	3	19.33±15.50		
Molecular targeted therapy	No	274	20.95±7.30	2.137	0.033
	Yes	7	15.00±6.06		
TCM (traditional Chinese medicine) therapy	No	278	20.76±7.31	-1.077	0.282
	Yes	3	25.33±8.51		
Supportive treatment	No	279	20.84±7.34	0.931	0.353
	Yes	2	16.00±2.83		
hospitalizations	1-2	138	22.36±7.33	7.313	< 0.001
	3-5	83	20.13±6.65		
	6-10	37	19.97±6.35		
	≥10	23	15.26±8.18		
Complication	No	141	21.09±7.36	0.645	0.520
	Yes	140	20.52±7.31		

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Table 5(on next page)

Table 5 Results of multiple linear regression of financial toxicity factors

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Table 5 Results of multiple linear regression of financial toxicity factors

Independent variable	Regression coefficient	Standard error	Normalized regression coefficient	t	P
(Constant)	-8.913	10.041		-.888	0.376
Children age	1.982	0.678	0.256	2.923	0.004
Per capita monthly household income	2.217	0.613	0.251	3.613	0.001
Treatment costs in the last three months	4.401	2.157	0.123	2.040	0.042
Marital status	-11.421	4.947	-0.138	-2.309	0.022

2 *: R^2=0.403, adjusted R^2=0.310, F=4.338, $P < 0.001$

Table 6(on next page)

Table 6 Correlation analysis between financial toxicity and quality of life

1

Table 6 Correlation analysis between financial toxicity and quality of life

	1	2	3	4	5	6	7	8	9
Economic toxicity score	1								
Economic expenditure	0.714**	1							
Economic resources	0.675**	0.346**	1						
Psychosocial response	0.983**	0.652**	0.557**	1					
Quality of life score	0.553**	0.398**	0.318**	0.556**	1				
Physiological condition	0.504**	0.331**	0.196**	0.535**	0.758**	1			
Social and family status	0.202**	0.151*	0.443**	0.125*	0.485**	0.104	1		
Emotional status	0.412**	0.340**	-0.012	0.466**	0.694**	0.501**	-0.005	1	
Functional status	0.401**	0.274**	0.265**	0.398**	0.810**	0.476**	0.295**	0.404**	1

2    $^*P<0.05$，$^{**}P<0.01$

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