High sedentary behaviour and low physical activity are associated with lower health related quality of life in Myanmar and Vietnam

Supa Pengpid¹,² and Karl Peltzer²*

Abstract: The study aimed to estimate independent and combined associations of sedentary behaviour and physical activity with health related quality of life (HRQoL) in Myanmar and Vietnam. The cross-sectional sample included 3201 chronic disease patients (median age 51 years, Interquartile Range 25) systematically recruited from primary care facilities. Sedentary time and physical activity were assessed with the General Physical Activity Questionnaire (GPAQ). Overall, the study population engaged <4 hours (51.3%), 4 ≤8 hours (31.2%), and 8 or more hours a day (17.5%) sedentary time a day; 30.7% engaged in low physical activity 50% moderate and 23.6% high physical activity. In the final linear regression model, adjusted for relevant confounders, higher sedentary time (≥8 h) decreased summative HRQoL, HRQoL-Psychological, HRQoL-Physical and HRQoL-social, and moderate and/or high physical activity were associated with better summative HRQoL, HRQoL-Psychological, HRQoL-Physical, and better HRQoL-environment. Combined regression analysis found that participants with both less than eight hour of sedentary time and moderate or

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PUBLIC INTEREST STATEMENT

People living with one or more chronic health condition are more likely to engage in sedentary behaviour and low physical activity and may have a lower health-related quality of life than in the general population. This paper reports findings from a study that assessed the independent and combined associations of sedentary behaviour and physical activity with health-related quality of life among chronic disease patients in Myanmar and Vietnam. This study highlights that independent and combined association between moderate or high physical activity and low sedentary time with health-related quality of life among chronic disease patients in Myanmar and Vietnam.
high physical activity had a significantly higher summative HRQoL, HRQoL-
Physical, HRQoL-Psychological, HRQoL-social, and HRQoL-environment. Findings
suggest an independent and combined association between moderate or high
physical activity and low sedentary time with HRQoL among chronic disease
patients in Myanmar and Vietnam.

**Subjects:** Health Psychology; General Psychology; Mental Health

**Keywords:** sedentary behaviour; physical activity; health related quality of life; chronic
diseases; adults; Myanmar; Vietnam

1. **Introduction**

Chronic disease patients may more likely engage in sedentary behaviour and physical inac-
tivity and have a lower health-related quality of life (HRQoL) than in the general population
(Milton, Macniven, & Bauman, 2014; Peltzer & Pengpid, 2015; Pengpid & Peltzer, 2016, 2018).
Therefore it would be important to assess the impact of sedentary behaviour and physical
activity on HRQoL in chronic disease patients. “Sedentary behavior refers to certain activities
in a reclining, seated, or lying position requiring very low energy expenditure. It has been
suggested to be distinct from physical inactivity and an independent predictor of metabolic
risk even if an individual meets current physical activity guidelines.” (Panahi & Tremblay,
2018, p.258). In a systematic review “strong evidence of a relationship between sedentary
behaviour and all-cause mortality, fatal and non-fatal cardiovascular disease, type 2 diabetes
and metabolic syndrome” was found (De Rezende, Rodrigues Lopes, Rey-López, Matsudo, &
Luiz Odo, 2014). Physical activity has benefits for physical health and HRQoL (Bize, Johnson &
Plotnikoff, 2007).

In a recent systematic review, Boberska et al. (2018) found an association between “lower
levels of sedentary behaviours with higher physical HRQoL.” Most studies reviewed, evalu-
ated the impact of sedentary behaviour on HRQoL in patients with specific chronic conditions
and most studies were conducted in high-income countries. In a systematic review among
children and adolescents “higher levels of physical activity were associated with better
health-related quality of life and increased time of sedentary behavior was linked to lower
health-related quality of life among children and adolescents.” (Wu et al., 2017). In a systematic review among older adults, “physical activity was positively and consistently
associated with some QoL domains” (Vagetti et al., 2014). In a review of the general
adult population, “cross-sectional studies showed a consistently positive association
between self-reported physical activity and health-related quality of life.” (Bize, Johnson &
Plotnikoff, 2007).

Few studies have evaluated the combined effects of sedentary behaviour and physical
activity on health-related quality of life (HRQoL) (Loprinzi, 2015). In combined sedentary
behaviour and physical activity analysis among adults in the US, persons with low sedentary
behaviour/moderate-to-vigorous physical activity and moderate sedentary behaviour/moder-
ate-to-vigorous physical activity had higher odds of better HRQoL (Kim, Im, & Choi, 2017).
Loprinzi (2015) found in a US sample that moderate-to-vigorous physical activity was asso-
ciated with better HRQoL among participants whose sedentary behaviour was 487.5 min/day
or more.

Higher sedentary time and inadequate physical activity may have more deleteriously effects on
persons with metabolic risk factors and other chronic conditions (Chu & Moy, 2013). It was
hyposphesized that higher sedentary time and low physical inactivity negatively impact indepen-
dently and combined on HRQoL. The study aimed to assess the independent and combined
associations of sedentary behaviour and physical activity with HRQoL among chronic disease patients in Myanmar and Vietnam.

2. Methods

2.1. Sample and procedure
A cross-sectional survey was conducted with out-patients with chronic diseases in rural and urban primary health facilities in Myanmar and Vietnam. “Every eligible patient (18 years and older treated for a chronic disease in the past 12 months) was selected from the health facility, using a convenient sampling procedure (consecutively selecting every out-patient visiting the health facility).” (Pengpid & Peltzer, 2018, p.1308). Patients provided informed consent prior to an interview-administered questionnaire. The study protocol was approved by the ethics committees of all participating institutions (Pengpid & Peltzer, 2018).

2.2. Measures

2.2.1. Exposure variables
Sedentary behaviour was assessed with the “General Physical Activity Questionnaire (GPAQ)” (World Health Organisation (WHO), 2009). Starting with an explanatory statement: “The following question is about sitting or reclining at work, at home, getting to and from places, or with friends, including time spent [sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television], but do not include time spent sleeping” and the question was: “How much time do you usually spend sitting or reclining on a typical day?” (WHO, 2009). Sedentary time was categorized into <4 hours, 4 ≤ 8 hours, 8 or more hours a day (Ekelund et al., 2016).

Physical activity was assessed with the GPAQ (Armstrong & Bull, 2006; WHO, 2009). Using GPAQ guidelines (WHO, 2009), results were classified into low, moderate and high physical activity.

2.2.2. Outcome variables
HRQoL was assessed with the “World Health Organization Quality of Life (WHOQol)-8” (Schmidt, Mühlau, & Power, 2006). The 8-item scale “consists of two items from each domain of the original WHOQOL BREF (physical, psychological, environmental, and social)” (Da Rocha, Power, Bushnell, & Fleck, 2012). “Results from the 2-items sub-scales and the 8-items were summed to get sub-scale and overall WHOQol scores which was then transformed to a 0–100 scale.” (Pengpid & Peltzer, 2018) The Cronbach alpha for the WHOQol-8 was 0.86 in this sample.

2.2.3. Confounding variables
Sociodemographic variables included age, sex, country, formal education, and residential status (Pengpid & Peltzer, 2018).

Current tobacco use was assessed with two questions, (1) “Do you currently use one or more of the following tobacco products (cigarettes, snuff, chewing tobacco, cigars, etc.)?” and (2) “Do you currently use any smokeless tobacco, such as snuff, chewing tobacco, betel?” Response options were “yes” or “no” (World Health Organization (WHO), 1998). Current tobacco use was defined as any tobacco use.

Problem drinking was assessed by the “Alcohol Use Disorder Identification Test (AUDIT)-C” (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). Cronbach alpha for the AUDIT-C was 0.82 in this study.
**Chronic conditions** were assessed by self-reported health care provided diagnosed chronic conditions treated in the past 12 months for any of 21 chronic conditions, such as diabetes and chronic obstructive pulmonary disease (Pengpid & Peltzer, 2018).

### 2.3. Data analysis

The data were analysed with IBM SPSS Statistics for Windows (Version 25.0. Armonk, NY: IBM Corp.). Parametric and non-parametric tests were used to calculate differences in proportions and medians. Multivariable linear regression was used to calculate beta coefficients and confidence intervals of the independent associations of sedentary behaviour and physical activity with HRQoL and its four domains. Moreover, we used multivariable linear regression to estimate the combined relationship between sedentary behaviour and physical activity with HRQoL and its four domains. Multivariable models were adjusted for relevant confounders, including age, sex, country, education, residence, tobacco use, problem drinking, and number of chronic conditions. For the combined regression analysis, the sample was subdivided based on sedentary and physical activity levels into four groups: (1) high sedentary time (≥ 8 hours) plus low physical activity group (reference category), (2) high sedentary time (≥ 8 hours) plus moderate or high physical activity group, (3) low or moderate sedentary time (< 8 hours) plus low physical activity group, and (4) low or moderate sedentary time (< 8 hours) plus moderate or high physical activity group. A p < 0.05 was considered significant.

### 3. Results

#### 3.1. Sample characteristics

The total sample included 3201 adults, 1600 from Myanmar and 1601 from Vietnam, the median age was 51 years (interquartile range = 25 years), and 65.1% were female. Overall, the study population engaged <4 hours (51.3%), 4 ≤ 8 hours (31.2%), and 8 or more hours a day (17.5%) sedentary time a day. The physical activity levels of the respondents were, 26.4% low, 50.0 moderate and 23.6% high physical activity. The summative HRQoL score was 56.7, and its four domains: psychological 55.5, physical 54.8, social 59.6 and environment 56.7 (see Table 1).

#### 3.2. Associations between sedentary behaviour and HRQoL

In the final linear regression model, adjusted for relevant confounders, higher sedentary time (≥8 h) decreased summative HRQoL, HRQoL-Psychological, HRQoL-Physical and HRQoL-social. Further, 4—< 8 hours sedentary time increased HRQoL-environment (see Table 2).

#### 3.3. Associations between physical activity and HRQoL

In the final linear regression model, adjusted for relevant confounders, moderate and/or high physical activity were associated with better summative HRQoL, HRQoL-Psychological, HRQoL-Physical, HRQoL-social, and better HRQoL-environment (see Table 3).

#### 3.4. Combined effects of sedentary behaviour and physical activity on HRQoL

Dividing study participants into four sub-groups based on the levels of sedentary time and physical activity found that those reported less than eight hours of sedentary time and engaged in moderate or high physical activity had a significantly higher summative HRQoL, HRQoL-Physical, HRQoL-Psychological, HRQoL-Social and HRQoL-Environment compared to participants with high sedentary time (≥8 hours) and low physical activity, after adjusting for age,
sex, country, education, residence, tobacco use, problem drinking, and number of chronic conditions (see Table 4).

4. Discussion

The study aimed to assess independent and combined associations of sedentary behaviour and physical activity with HRQoL among chronic disease patients in Myanmar and Vietnam. Consistent with previous reviews (Bize et al., 2007; Boberska et al., 2018; Vagetti et al., 2014; Wu et al., 2017), the study found that higher sedentary time (≥ 8h) decreased summative HRQoL and three of four of its domains, and moderate and/or high physical activity increased summative HRQoL and all of its four domains, after adjusting for relevant confounders. Among the different HRQoL domains and sedentary behaviour, the

| Variable                          | Total (n = 3201) | Male (= 1115) | Female (n = 2084) | P-value |
|-----------------------------------|-----------------|---------------|-------------------|---------|
| Age in years, Median (Interquartile range) | 51 (25)        | 52 (25.5)     | 51 (25)           | 0.096   |
| Country                           |                 |               |                   |         |
| Myanmar                           | 1600 (50.0)     | 44.2          | 53.9              | <0.001  |
| Vietnam                           | 1601 (50.0)     | 55.8          | 46.1              |         |
| Education                         |                 |               |                   |         |
| Grade 0-5                         | 620 (19.4)      | 14.0          | 22.4              | <0.001  |
| Grade 6-11                        | 1635 (51.2)     | 50.0          | 51.9              |         |
| Grade 12 or more                  | 941 (29.4)      | 35.9          | 26.7              |         |
| Residence                         |                 |               |                   |         |
| Rural                             | 1640 (51.3)     | 49.5          | 52.2              | 0.152   |
| Urban                             | 1561 (48.8)     | 50.5          | 47.8              |         |
| Current tobacco use               | 761 (24.6)      | 46.0          | 31.5              | <0.001  |
| Problem drinking                  | 387 (12.2)      | 28.8          | 3.5               | <0.001  |
| Chronic conditions                |                 |               |                   |         |
| One                               | 1987 (62.1)     | 65.8          | 60.0              | <0.001  |
| Two                               | 838 (26.2)      | 25.3          | 26.9              |         |
| Three or more                     | 376 (11.7)      | 8.8           | 13.1              |         |
| Sedentary behaviour               |                 |               |                   |         |
| <4 hours                          | 1643 (51.3)     | 52.8          | 50.1              | 0.019   |
| 4- <8 hours                       | 998 (31.2)      | 32.2          | 30.8              |         |
| ≥8 hours                          | 560 (17.5)      | 15.0          | 19.1              |         |
| Physical activity                 |                 |               |                   |         |
| Low                               | 844 (26.4)      | 30.7          | 23.9              | <0.001  |
| Moderate                          | 1602 (50.0)     | 37.3          | 56.7              |         |
| High                              | 755 (23.6)      | 31.9          | 19.3              |         |
| HRQoL-total                       | 56.7 (12.2)     | 57.2 (12.8)   | 56.3 (11.8)       | 0.042   |
| HRQoL-Psychological               | 55.5 (14.3)     | 55.9 (14.9)   | 55.3 (14.2)       | 0.247   |
| HRQoL-Physical                    | 54.8 (15.7)     | 55.5 (15.7)   | 54.3 (15.2)       | 0.041   |
| HRQoL-Social                      | 59.6 (14.2)     | 59.8 (14.2)   | 59.3 (13.9)       | 0.383   |
| HRQoL-Environment                 | 56.7 (15.3)     | 57.3 (15.5)   | 56.2 (15.2)       | 0.057   |

HRQoL = Health related quality of life.
The strongest negative relationship was found between higher sedentary time (≥8 h) and HRQoL—Physical (Beta: -4.72, CI: -6.29 to -3.15), which is consistent with the previous review (Boberska et al., 2018).

Finally, the study confirms previous evidence with adult samples in the US (Kim et al., 2017; Loprinzi, 2015) suggesting that there is a combined effect between physical activity and sedentary behaviour on HRQoL total and its domains among chronic disease patients in Southeast Asia. Further, longitudinal studies are needed to confirm the found inverse relationship between sedentary behaviour and HRQoL. It is possible that poor HRQoL results in sedentary behaviour and low physical activity and that possible reciprocal relations of causality exist in that participants who perceive their HRQoL as poor may respond by spending their time in sedentary pursuits just as much as those who have a sedentary lifestyle will perceive their HRQoL as poor.

### 5. Study limitations

The investigation was cross-sectional in nature and no causal conclusions can be drawn. Further, the exposure variables, sedentary behaviour and physical activity were assessed by

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**Table 2. Odds ratios for overall HQoL and four HQoL domains according to levels of sedentary behaviour**

| Variable               | Unadjusted coefficient estimates: Beta (95% CI) | Adjusted coefficient estimates: Beta (95% CI) |
|------------------------|-------------------------------------------------|---------------------------------------------|
| Total HRQoL            |                                                 |                                             |
| Sedentary time a day   |                                                 |                                             |
| <4 hours               | Reference                                       | Reference                                   |
| 4- <8 hours            | -0.24 (-1.20 to 0.72)                           | 0.18 (-0.81 to 1.18)                        |
| ≥8 hours               | -3.73 (-4.91 to -2.55)**                         | -2.66 (-3.89 to -1.44)**                   |
| HRQoL—Psychological    |                                                 |                                             |
| Sedentary time a day   |                                                 |                                             |
| <4 hours               | Reference                                       | Reference                                   |
| 4- <8 hours            | -0.53 (-1.66 to 0.60)                           | -0.23 (-1.40 to 0.94)                       |
| ≥8 hours               | -5.27 (6.66 to -3.89)**                         | -3.85 (-5.29 to -2.41)**                   |
| HRQoL—Physical         |                                                 |                                             |
| Sedentary time a day   |                                                 |                                             |
| <4 hours               | Reference                                       | Reference                                   |
| 4- <8 hours            | -2.13 (-3.30 to -0.91)**                         | -1.47 (-2.73 to -0.18)*                    |
| ≥8 hours               | -6.03 (-7.54 to -4.53)**                         | -4.72 (-6.29 to -3.15)**                   |
| HRQoL—Social           |                                                 |                                             |
| Sedentary time a day   |                                                 |                                             |
| <4 hours               | Reference                                       | Reference                                   |
| 4- <8 hours            | 0.67 (-0.45 to 1.79)                            | 1.01 (-0.17, 2.19)                         |
| ≥8 hours               | -2.69 (-4.06 to -1.32)**                         | -1.72 (-3.17 to -0.27)*                    |
| HRQoL—Environment      |                                                 |                                             |
| Sedentary time a day   |                                                 |                                             |
| <4 hours               | Reference                                       | Reference                                   |
| 4- <8 hours            | 0.88 (-0.32 to 2.09)                            | 1.29 (0.03 to 2.55)*                       |
| ≥8 hours               | -1.05 (-2.53 to 0.42)                           | -0.47 (-2.02, 1.08)                        |

CI = Confidence Interval; 1Adjusted for age, sex, education, residence, tobacco use, problem drinking, and number of chronic conditions; **P < 0.001; **P < 0.01; *P < 0.05; HRQoL = Health related quality of life.
self-report and future studies should include objective measures as well. Some variables, such as body mass index, were not assessed in this investigation and should be included in future studies.

6. Conclusion
Our findings not only add to the current results demonstrating a beneficial independent effect of low sedentary time and moderate or high physical activity on HRQoL, but also extending findings from a few studies showing combined effects of low or moderate sedentary time and moderate or high physical activity on HRQoL. Health promotion strategies among chronic disease patients may include reducing sedentary behaviour and increasing physical activity in order to improve HRQoL.

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Table 3. Odds ratios for overall HRQoL and four HRQoL domains according to levels of physical activity

| Variable          | Unadjusted coefficient estimates: Beta (95% CI) | Adjusted coefficient estimates: Beta (95% CI) |
|-------------------|-----------------------------------------------|---------------------------------------------|
| Total HRQoL       |                                               |                                             |
| Physical activity |                                               |                                             |
| Low               | Reference                                     | Reference                                   |
| Moderate          | 1.48 (0.46 to 2.51)**                         | 1.86 (0.79 to 2.93)***                     |
| High              | 3.41 (2.21 to 4.62)***                        | 3.73 (2.47 to 4.99)***                     |
| HRQoL-Psychological |                                             |                                             |
| Physical activity |                                               |                                             |
| Low               | Reference                                     | Reference                                   |
| Moderate          | 0.56 (−0.66 to 1.77)                         | 0.91 (−0.36 to 2.18)                      |
| High              | 2.91 (1.48 to 4.33)***                       | 2.88 (1.39 to 4.37)***                     |
| HRQoL-Physical    |                                               |                                             |
| Physical activity |                                               |                                             |
| Low               | 1 (Reference)                                 | 1 (Reference)                              |
| Moderate          | 2.11 (0.80 to 3.93)**                        | 2.33 (0.95 to 3.70)***                     |
| High              | 3.91 (2.36 to 5.46)***                       | 3.83 (2.21 to 5.45)***                     |
| HRQoL-Social      |                                               |                                             |
| Physical activity |                                               |                                             |
| Low               | Reference                                     | Reference                                   |
| Moderate          | 2.06 (0.88 to 3.25)***                       | 2.50 (1.24 to 3.76)***                     |
| High              | 4.48 (3.08 to 5.88)***                       | 5.07 (3.59 to 6.56)***                     |
| HRQoL-Environment |                                               |                                             |
| Physical activity |                                               |                                             |
| Low               | Reference                                     | Reference                                   |
| Moderate          | 1.21 (−0.07 to 2.49)                         | 1.75 (0.39 to 3.10)*                       |
| High              | 2.12 (0.61 to 3.63)**                        | 2.95 (1.36 to 4.55)***                     |

CI = Confidence Interval; 1 Adjusted for age, sex, country, education, residence, tobacco use, problem drinking, and number of chronic conditions; **P < 0.001; **P < 0.01; *P < 0.05; HRQoL = Health related quality of life

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Table 4. Combined effects of sedentary behaviour and physical activity on HQoL and its four domains

| Variable                                | n   | M (SD)       | Unadjusted coefficient estimates: Beta (95% CI) | Adjusted coefficient estimates: Beta (95% CI) |
|-----------------------------------------|-----|--------------|------------------------------------------------|---------------------------------------------|
| Total HQoL                               |     |              |                                                 |                                             |
| High SB & low PA                        | 239 | 52.7 (13.7)  | Reference                                      | Reference                                   |
| High SB & moderate or high PA           | 308 | 54.4 (10.9)  | 1.72 (−0.32 to 3.77)                           | 2.91 (0.82 to 5.00)**                       |
| Low or moderate SB & low PA             | 578 | 56.1 (12.8)  | 3.42 (1.60 to 5.28)**                          | 2.93 (1.05 to 4.82)**                       |
| Low or moderate SB & moderate or high PA| 2010| 57.6 (11.9)  | 4.95 (3.32 to 6.57)**                          | 4.71 (3.06 to 6.36)**                       |
| HRQoL-Psychological                     |     |              |                                                 |                                             |
| High SB & low PA                        | 240 | 51.5 (14.9)  | Reference                                      | Reference                                   |
| High SB & moderate or high PA           | 311 | 51.2 (12.7)  | 0.31 (−2.72 to 2.11)                           | 1.03 (−1.43 to 3.49)                        |
| Low or moderate SB & low PA             | 583 | 55.8 (15.4)  | 2.30 (1.15 to 6.45)**                          | 4.51 (2.29 to 6.73)**                       |
| Low or moderate SB & moderate or high PA| 2025| 56.6 (14.2)  | 5.07 (3.15 to 6.99)**                          | 4.80 (2.86 to 6.75)**                       |
| HRQoL-Physical                          |     |              |                                                 |                                             |
| High SB & low PA                        | 239 | 49.2 (19.4)  | Reference                                      | Reference                                   |
| High SB & moderate or high PA           | 308 | 51.4 (14.8)  | 2.21 (−0.42 to 4.83)                           | 2.88 (0.21 to 5.56)*                        |
| Low or moderate SB & low PA             | 585 | 54.3 (16.4)  | 2.04 (2.70 to 7.37)**                          | 3.11 (0.70 to 5.51)*                        |
| Low or moderate SB & moderate or high PA| 2015| 56.6 (14.2)  | 6.88 (4.80 to 8.96)**                          | 5.87 (3.76 to 7.95)**                       |
| HRQoL-Social                            |     |              |                                                 |                                             |
| High SB & low PA                        | 240 | 55.2 (18.2)  | Reference                                      | Reference                                   |
| High SB & moderate or high PA           | 311 | 58.6 (13.1)  | 3.43 (1.05 to 5.81)**                          | 4.75 (2.29 to 7.22)**                       |
| Low or moderate SB & low PA             | 587 | 58.4 (13.8)  | 3.20 (1.08 to 5.33)**                          | 2.79 (0.57 to 5.02)**                       |
| Low or moderate SB & moderate or high PA| 2024| 60.6 (14.2)  | 5.36 (3.47 to 7.26)**                          | 5.31 (3.36 to 7.26)**                       |
| HRQoL-Environment                       |     |              |                                                 |                                             |
| High SB & low PA                        | 240 | 54.7 (16.6)  | Reference                                      | Reference                                   |
| High SB & moderate or high PA           | 311 | 56.1 (15.4)  | 1.46 (−1.11 to 4.03)                           | 2.82 (0.18 to 5.47)*                        |
| Low or moderate SB & low PA             | 589 | 56.0 (15.6)  | 1.21 (−1.08 to 3.50)                           | 1.34 (−1.01 to 3.76)                        |
| Low or moderate SB & moderate or high PA| 2031| 57.2 (15.0)  | 2.50 (0.46 to 4.54)**                          | 2.87 (0.78 to 4.97)**                       |

CI = Confidence Interval; SB = Sedentary behaviour; PA = Physical activity; 1Adjusted for age, sex, country, education, residence, tobacco use, problem drinking, and number of chronic conditions; **P < 0.001; *P < 0.01; *P < 0.05; HRQoL = Health related quality of life;
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