Review

Psychological variables associated with quality of life following primary treatment for head and neck cancer: a systematic review of the literature from 2004 to 2015

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Abstract

Objective: There has been a recent proliferation of research on quality of life (QoL) in head and neck cancer (HNC). The objective of this review was to systematically examine the evidence on psychological factors associated with QoL outcomes for HNC survivors in the post-treatment period published during 2004–2015.

Methods: Five databases were searched for studies investigating psychological factors associated with QoL in HNC survivors. Empirical studies published between January 2004 and June 2015 were included if they measured QoL as an outcome following treatment using a reliable and valid measure, examined its association with at least one psychological factor and included at least 50 HNC survivors.

Results: Twenty-four publications describing 19 studies (9 cross-sectional, 10 prospective) involving 2,263 HNC survivors were included. There was considerable heterogeneity in study design and diversity in measurement and analysis. Distress-related variables (depression, anxiety, distress) were most frequently investigated, and mostly reported negative associations with QoL outcomes. Associations were also observed between other psychological factors (e.g., coping, neuroticism and fear of recurrence) and QoL.

Conclusions: Several psychological factors predict QoL among HNC survivors who have completed treatment. Routine screening and early interventions that target distress could improve HNC survivors' QoL following treatment. Longitudinal and population-based studies incorporating more systematic and standardised measurement approaches are needed to better understand relationships between psychological factors and QoL and to inform the development of intervention and supportive care strategies.
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Background

Head and neck cancer (HNC) refers to a group of related neoplasms of the oral cavity, pharynx, larynx, nasal cavity, middle ear and sinuses [1]. HNC constitutes the seventh most commonly diagnosed cancer and the seventh most common cause of death from cancer worldwide with approximately 686 000 new diagnoses and 376 000 estimated deaths in 2012 [2]. Treatment for HNC typically involves surgery, radiation therapy, chemotherapy or a combination thereof. Such treatments are often aggressive and can severely impact survivors' quality of life (QoL) [3–5], for example, through visible disfigurement and functional difficulties relating to eating, breathing and speech [6–8].

Quality of life[1] is a multifaceted construct describing individuals' 'physical health, psychological state, level of independence, social relationships and relationships to salient features in their environment' [9]. QoL is an important outcome in HNC [3,4,10,11]; it assesses the impact of diagnosis and treatment from the perspective of the patient [12] and has a strong positive relationship to survival [13,14]. QoL may also be a particularly important outcome for HNC survivorship; research has consistently identified clinical and functional issues that negatively influence QoL following HNC treatment, including xerostomia, sticky saliva, cancer-related fatigue, visible disfigurement and impairments in speech, taste/smell, swallowing and sexual functioning [8]. Although some of these issues improve over time following HNC

treatment, many persist 12 months after treatment and can profoundly impact HNC survivors' psychological well-being [5]. A recent narrative review highlighted potentially modifiable psychological factors that may be associated with lower QoL among HNC survivors who have finished primary treatment, including heightened distress, body image concerns, fear of recurrence (FoR) and the use of avoidant coping strategies [6]. This research implicates the potential importance of psychological factors in predicting the QoL of HNC survivors.

A systematic review published in 2005 [15] examining behavioural and psychosocial predictors of QoL in HNC survivors found that psychosocial predictors including depression, personality, social support and satisfaction with consultant information were significantly associated with QoL in this population. The authors underscored the presence of inconclusive findings for certain psychological predictors (e.g. perceived social support) and a dearth of studies on others (e.g. coping), highlighting the need for further high-quality research on psychological predictors of QoL. Since 2005, there has been a proliferation of HNC QoL research. Following these considerations, we undertook a systematic review to examine the current state of the evidence on psychological factors associated with QoL among HNC survivors who had completed their primary treatment. In particular, we aimed to identify the associations between psychological variables (i.e. variables relating to individuals' cognitive and/or emotional processes) measured before, during or after HNC treatment and QoL outcomes measured following HNC treatment. Identifying psychological variables associated with post-treatment QoL could aid in the early identification of those at risk for poorer outcomes (e.g. those with particular personality styles) and inform the development of interventions to promote QoL in this population (e.g. by focusing on the training of key psychological skills, which may be modifiable).

Methods

Search strategy

In line with preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines [16], a systematic search of the literature on QoL in HNC was conducted using five databases: MEDLINE, CINAHL, PsycINFO, EMBASE and Web of Science (all Core Collection: Citation Indexes & Chemical Indexes). Four of these databases (MEDLINE, CINAHL, PsycINFO and EMBASE) were searched using controlled vocabulary search terms for HNC and QoL. The fifth database, Web of Science, was searched using analogous free text search terms derived from [15] (Supporting Information). All searches were limited to include only literature published in the English language during 01 January 2004 to 08 June 2015. The reference lists of included articles were also manually searched for any additional articles. Figure 1 illustrates the number of papers identified, screened, assessed for eligibility and included in this review.

Selection criteria

Detailed inclusion and exclusion criteria are provided in Table 1. We defined HNC as neoplasms of the oral cavity, larynx, pharynx, nasal cavity, middle ear and sinuses only. All articles describing studies that exclusively comprised HNC survivors with cancers of the face (e.g. basal cell carcinomas), lip, ears, eyes or thyroid were excluded. This review focussed on survivors in the post-primary treatment phase as this is considered a 'teachable moment' within which interventions to aid psychological well-being may be targeted [3]. All empirical papers investigating the relationship between QoL among HNC patients following primary treatment and at least one psychological variable were deemed eligible; articles that did not clearly report that all participants had received or finished primary treatment for HNC were ineligible. We defined psychological variables as variables comprising individuals' cognitive and/or emotional processes and used this definition to guide the application of our inclusion/exclusion criteria. Following Llewellyn *et al.* [15], articles were excluded if QoL measurement was limited to functional status, or a measure of disfigurement only, or involved the use of a distress-specific instrument such as the Hospital Anxiety and Depression Scale (HADS).

Data extraction

Titles and abstracts of identified articles were independently screened for eligibility by two authors (S. D. and O. M.). Full texts of potentially eligible articles were obtained and assessed for eligibility by each reviewer according to the aforementioned criteria. Any discrepancies were resolved through discussion and/or consultation with the third author (P. G.). The following data were extracted from eligible articles: (1) study location; (2) aim(s); (3) design; (4) recruitment setting; (5) survivor characteristics (age, gender, site of tumour and treatment received); (6) QoL tool used; (7) psychological predictors assessed (and tools used); (8) assessment time-points; (9) whether or not psychological factors or their sub-components (e.g. neuroticism) were associated with QoL in cross-sectional analyses (and, if so, the specific results in the overall study population and subgroups considered); and (10) whether or not psychological factors or their sub-components were associated with QoL in prospective analyses (and, if so, the specific results). Where available, results derived from multiple regression models were extracted. Otherwise, unadjusted results were abstracted.

Quality assessment

Eligible articles were critically appraised by two authors (S. D. and L. C.) to evaluate their risk of bias using a
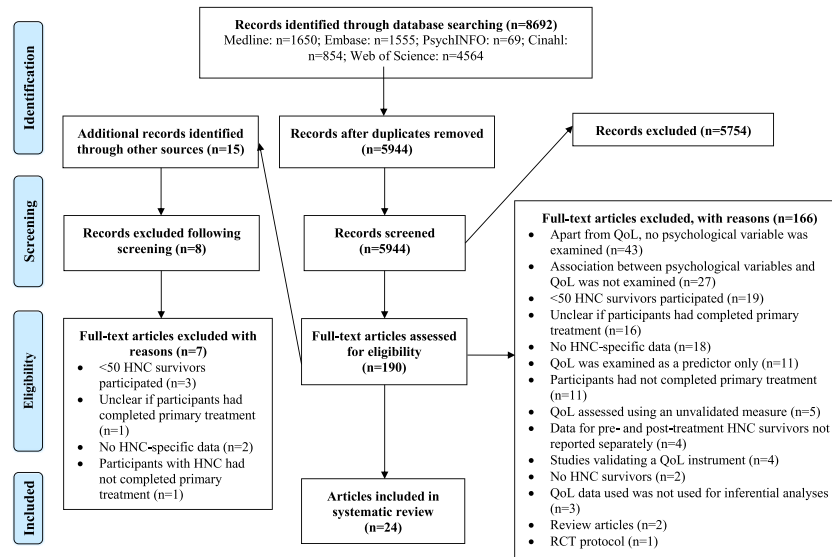
Figure 1. Papers identified, screened, assessed for eligibility and included for review

Table 1. Article inclusion/exclusion criteria

Inclusion criteria	Exclusion criteria
1. Articles describing empirical studies with HNC survivors with a QoL measurement instrument that was recognised as a reliable and valid measure and provided a measure of global QoL.	1. Variables associated with QoL were clinical or related to symptoms (e.g. pain and xerostomia).
2. Articles describing the association between QoL and at least one psychological factor.	2. Studies exclusively involving cancers of the face, ears, eyes and thyroid.
3. QoL was measured following primary treatment.	3. Studies exclusively comprising participants receiving palliative care.
4. Participants were at least 18 years old.	4. Qualitative studies, editorials, reviews, letters, notes, guidelines, conference proceedings and continuing education units.
5. Studies with QoL outcome data for $N \geq 50$ HNC patients.	5. Non-English language studies.
	6. Primary aim of the study was QoL instrument validation.

HNC, head and neck cancer; QoL, quality of life.

12-item checklist, which was based on a checklist from previous research [17,18] supplemented by standard critical appraisal questions [19]. Articles were given a score of 2 for items marked as 'Yes', 1 for items marked as 'Partially' and 0 for items marked as 'No' on the checklist. Articles were considered to have good quality if they scored 17 or more out of a maximum possible score of 24, adequate quality if they scored 9–16 and poor quality if they scored 0–8. Where disagreement between the appraising authors arose, consensus was achieved through discussion. A third author (P. G.) was consulted if disagreement persisted.

Statistical analysis

Due to heterogeneity in the analyses between the studies described in the included articles, meta-analysis was not undertaken.

Results

Following database searching and initial screening of titles and abstracts, the full texts of 190 articles were assessed for eligibility. Of these, 24 articles reporting 19 studies fulfilled the inclusion criteria. Characteristics of, and summary results from, these studies [20–43] are provided in Table 2. A full description of results of these studies is provided in Table S1.

Study characteristics

The 19 studies (described in 24 articles) included 2347 patients, of whom 673 (29%) were women. Only 16 studies reported participants' age (M=61 years, range = 23–94). Sample sizes ranged from 51 to 376 and included HNC survivors with cancers affecting the oral cavity (n = 16), pharynx (n = 15), larynx (n = 12), tongue (n = 6),

Table 2. Characteristics of included articles

Author [Ref]	Country/region	Study design	Total sample size (with QoL data)	Site of HNC (N)	Measurement time-points	QoL outcome measure	Psychological variables assessed (measure)	Psychological variables significantly associated with QoL [direction of impact on QoL]	Quality assessment rating
Aarstad et al. [20]a	Norway	Prospective	96	Oral cavity (29); salivary glands (2); pharynx (16); larynx (42); sinus (3); unknown (3); lip (1)	At least 1 year post-treatment	EORTC QLQ-C30, EORTC QLQ-H&N35	Coping (COPE)	Avoidance-coping [-]	Acceptable
Aarstad et al. [21]a	Norway	Prospective	96	Oral cavity (29); salivary glands (2); pharynx (16); larynx (42); sinus (3); unknown (3); lip (1)	T1 = 48 ± 2 months post-diagnosis; T2 = 95 ± 3 months post-diagnosis	EORTC QLQ-C30, EORTC QLQ-H&N35	Personality (EPI), coping (COPE)	Neuroticism [−]; avoidance-coping [−]; problem-focused coping [−]; coping by humour [−]	Acceptable
Aarstad et al. [22]b	Norway	Prospective	139	Tongue (26); gums (9); oral cavity (13); tonsil (24); oro/hypopharynx (5); sinus/nasal cavity/nasopharynx (6); larynx (52); unknown (6); lung* (1)	At least 1 year post-treatment	EORTC QLQ-C30 and EORTC QLQ-H&N35	Personality (EPI), coping (COPE), humour (Svebak Humour Questionnaire)	Neuroticism [−]; avoidance-coping [−]; problem-focused coping [−]; sense of humour [−]	Acceptable
Beisland et al. [23]b	Norway	Prospective	139	Tongue (26); gums (9); oral cavity (13); tonsil (24); oro/hypopharynx (5); sinus/nasal cavity/nasopharynx (6); larynx (52); unknown (6); lung* (1)	T1 = at least 1 year post-treatment; T2 = at least 4 years post-treatment	EORTC QLQ-C30, EORTC QLQ-H&N35	Distress (GHQ-30), Personality (EPI), Coping (COPE)	Neuroticism [−]; distress [−]; avoidance-coping [−]; problem-focused coping [−]	Acceptable
Chiou et al. [24]	Taiwan	Cross-sectional	73	Nasopharynx (26); oral cavity (47)	1 year post-treatment	EORTC QLQ-C30, EORTC QLQ-H&N35	Depression (BDI-Chinese)	Depression [-]	Good
Cnossen et al. [25]	the Netherlands	Prospective	67	Oral cavity (12); oropharynx (18); hypopharynx (8); larynx (29)	T1 = diagnosis; T2 = approximately 1 month post-treatment	EORTC QLQ-C30, EORTC QLQ-H&N35	Anxiety and depression (HADS)	Distress (Total HADS score) [-]	Good
Eadie and Bowker [26]	USA	Cross-sectional	67	Larynx (67)	At least 9 months post-laryngectomy	UW-QoL	Coping (WOC-CV)	Seeking or using social support [−]; cognitive escape-avoidance [−]; behavioural escape-avoidance [−]; focusing on the positive [−]	Good
Ghazali et al. [27]	UK	Prospective	189	Oral cavity (135); pharynx (43)	T1 = 12 ≥ 48 months post-treatment; T2 = approximately 7 months after first time-point	UW-QoL	Fear of recurrence	Fear of recurrence[-]	Good
Hassanein et al. [28]	UK	Cross-sectional	68	Maxilla (5); oral cavity (20); tongue (14);	6 months–6 years post-treatment	UW-QoL, EORTC QLQ-C30	Anxiety and depression (HADS)	Anxiety [−], depression [-]	Acceptable

(Continues)

Table 2. (Continued)

Author [Ref]	Country/region	Study design	Total sample size (with QoL data)	Site of HNC (N)	Measurement time-points	QoL outcome measure	Psychological variables assessed (measure)	Psychological variables significantly associated with QoL [direction of impact on QoL]	Quality assessment rating
Holloway et al. [29]	USA	Cross-Sectional	105	oropharynx (8); inferior alveolus (12); other (9) Oropharynx (27); oral cavity (28); hypopharynx (9); larynx (36); other(4)	At least 5 years post-treatment	FACT-G, FACT-H&N	Health-related attitudes (MBHI), coping (MBHI), satisfaction with social support (SSQSR)	Satisfaction with social support/premorbid pessimism[+]	Acceptable
Hong et al. [30]	China	Prospective	93	Nasopharynx (93)	T1 = pre-treatment; T2 = post-treatment	EORTC QLQ-C30	Anxiety and depression (HADS), coping (MCMQ)	Anxiety [-] confrontation coping[+]	Acceptable
Katre et al. [31]	UK	Cross-sectional	252	Oral cavity (211); oropharynx (29)	At least 3 months post-treatment	UW-QoL	Body-image (DAS24)	Body-image [-]	Good
Kelly et al. [32]	UK	Prospective	202	Sinus (5); oral cavity (40); oropharynx (41); hypopharynx (22); larynx (83); nasal cavity (2); nasopharynx (7); unknown (3)	T1 = pre-treatment; T2 = mid-treatment; T3 = post-treatment	UW-QoL	Anxiety and depression (HADS)	Depression [-]	Acceptable
Llewellyn et al. [33]c	UK	Prospective	82	Lip (4); tongue (19); oral cavity (18); parotid/salivary gland (2); tonsil (7); oropharynx (12); hypopharynx (1); larynx (17); skin (non-melanoma) (2)	T1 = diagnosis; T2 = pre-treatment; T3 = 1 month post-treatment; T4 = 6–8 months post-treatment	MOS SF-12	Satisfaction with information (SCIP)	Satisfaction with information [+]	Acceptable
Llewellyn et al. [34]c	UK	Prospective	82	Lip (4); tongue (19); oral cavity (18); parotid/salivary gland (2); tonsil (7); oropharynx (12); hypopharynx (1); larynx (17); skin (non-melanoma) (2)	T1 = diagnosis; T2 = pre-treatment; T3 = 1 month post-treatment; T4 = 6–8 months post-treatment	EORTC QLQ-C30, MOS SF-12, PGI	Illness perceptions (IPQ-R), health beliefs (BMQ), satisfaction with information (SCIP), coping (Brief COPE), anxiety and depression (HADS), optimism (LOT-R)	Anxiety [−], optimism [+], patient satisfaction [+], acceptance coping [-]	Good
Llewellyn et al. [35]	UK	Prospective	103	Oral cavit (68); larynx (18); pharynx (8); other (8)	T1 = pre-treatment; T2 = 6 months post-treatment	MOS SF-12, EORTC QLQ-C30	Benefit finding (BFS), optimism (LOT-R), coping (Brief COPE)	Emotional growth (Benefit Finding domain) [+]	Good
Neilson et al. [36]	Australia	Prospective	102	Oral cavity (33); oropharynx (29);	T1 = pre-treatment; T2 = post-treatment	FACT-H&N	Depression [−], anxiety [-]	Depression [−], anxiety [-]	Acceptable

(Continues)

Table 2. (Continued)

Author [Ref]	Country/ region	Study design	Total sample size (with QoL data)	Site of HNC (N)	Measurement time-points	QoL outcome measure	Psychological variables assessed (measure)	Psychological variables significantly associated with QoL [direction of impact on QoL]	Quality assessment rating
				larynx/hypopharynx (23); parotid gland (7); paranasal sinus/nasal cavity (4); nasopharynx (3); thyroid (2)			Anxiety and depression (HADS)		
Osthus et al. [37]b	Norway	Prospective	139	Tongue (26); gums (9); oral cavity (13); tonsil (24); oro/hypopharynx (5); sinus/nasal cavity/nasopharynx (6); larynx (52); unknown (6); lunga (1)	At least 1 year post-treatment	EORTC QLQ-H&N35	Personality (EPI), coping (COPE)	Neuroticism [−], avoidance-coping [-]	Good
Osthus et al. [38]b	Norway	Prospective	139	Tongue (26); gums (9); oral cavity (13); tonsil (24); oro/hypopharynx (5); sinus/nasal cavity/nasopharynx (6); larynx (52); unknown (6); lunga (1)	At least 1 year post-treatment	EORTC QLQ-30	Personality (EPI), coping (COPE)	Neuroticism [−], avoidance-coping [-]-	Acceptable
Precious et al. [39]	UK	Cross-sectional	376	Oral cavity (217); pharynx (80); larynx (67); other(12)	Post-treatment	UW-QoL	Burden of care (Study-specific questionnaire)	Perceived care [−], daily burden of care [-]	Acceptable
Rana et al. [40]	Germany	Cross-sectional	104	Oral cavity (64); tongue (22); gums (18)	Post-treatment	UW-QoL	Coping (FQCI)	Depressive coping [-]	Acceptable
Smith et al. [41]	Australia	Cross-sectional	63	Tongue (25); oral cavity (27); gums (11)	>1 year post-treatment	FACT-G, FACT-H&N, UW-QoL	Fear of recurrence (Study-specific questionnaire)	Fear of recurrence [-]	Acceptable
Trzcieniecka-Green et al. [42]	Poland	Cross-sectional	51	Larynx (51)	2 weeks–3 years post-treatment	EORTC QLQ-C30 and EORTC QLQ-H&N35	Anxiety and depression (HADS)	Anxiety [−], depression [-]	Poor
Verdonck-de Leeuw et al. [43]	the Netherlands	Prospective	55	Larynx/hypopharynx (22); oral cavity/oropharynx (18); nasopharynx (5); salivary glands (2); other (8)	T1 = post-diagnosis; T2 = approximately 5 months post-treatment	EORTC QLQ-C30 and EORTC QLQ-H&N35	Anxiety and depression (HADS)	Distress [-]	Acceptable

BDI, Beck Depression Inventory; BFS, Benefit Finding Scale; BMQ, Beliefs about Medicines Questionnaire; COPE, Coping Orientations to Problems Experienced; DAS24, Derriford Appearance Scale; EORTC QLQ-C30, General QoL module of European Organization for Research and Treatment of Cancer Questionnaire; EORTC QLQ-H&N35, HNC QoL module of European Organization for Research and Treatment of Cancer Questionnaire; EPI, Eysenck Personality Inventory; FACT-G, Functional Assessment of Cancer Therapy-General Scale; FACT-H&N, Functional Assessment of Cancer Therapy – Head and Neck Scale; FoR – Fear of Recurrence Scale; FQCI – Freiburg Questionnaire on Coping with Illness; GHQ-30 – General Health Questionnaire; HADS – Hospital Anxiety and Depression Scales; IPQ-R – Illness Perception Questionnaire-Revised; LOT-R – Life Orientation Test-Revised; MAC-Q – Mental Adjustment to Cancer-Questionnaire; MBHI – Millon Behavioral Health Inventory; MCMQ – Medical Coping Modes Questionnaire; PGI – The Patient Generated Index; SAS – Self-Rating Anxiety Scale; SCIP – The Satisfaction with Cancer Information Profile; SDS – Self-Rating Depression Scale; MOS SF-12 – Medical Outcomes Study Short Form(12) Health Survey; SSQSR – Social Support Questionnaire; UW-QoL – University of Washington Quality of Life Questionnaire; WHOQOL-BREF – World Health Organization Quality of Life Scale – Abbreviated Version; WOC-CV – Ways of Coping-Cancer Version.
*HNC was a secondary tumour site in these patients.
aArticles [20,21] are taken from the same study;
bArticles [22,23,37,38] are taken from the same study;
cArticles [33,34] are taken from the same study.

sinuses ($n=4$), gums ($n=3$), salivary glands ($n=3$), nasal cavity ($n=3$), inferior alveolus ($n=1$) and/or unknown or unspecified primary HNC ($n=13$). At the time of final QoL assessment, HNC survivors had completed their primary cancer treatment from 1 month to 7 years previously. The eligible articles included cross-sectional ($n=9$) and prospective ($n=10$) designs.[2] Studies were conducted in eight countries/regions: UK ($n=7$), Norway ($n=2$), USA ($n=2$), Australia ($n=2$), the Netherlands ($n=2$), Germany ($n=1$), China ($n=1$), Poland ($n=1$) and Taiwan ($n=1$). Participants had received surgery, radiation, chemotherapy or a combination thereof ($n=9$), surgery and/or radiation ($n=6$), chemotherapy and/or radiation ($n=1$), surgery only ($n=1$), radiation only ($n=1$) or treatment was not specified ($n=1$). Participants were recruited from either single clinics ($n=14$), multiple clinics ($n=4$) or support groups and professional contacts ($n=1$).

There was considerable heterogeneity in the questionnaires used to measure QoL: the general QoL module of the European Organization for Research and Treatment of Cancer Questionnaire (EORTC QLQ-C30; $n=13$), EORTC HNC QoL (EORTC QLQ-H&N35; $n=9$), University of Washington Quality of Life Questionnaire (UW-QoL; $n=7$), Functional Assessment of Cancer Therapy – Head and Neck Scale (FACT-HN; $n=3$), Medical Outcomes Study Short Form (12) Health Survey (MOS SF-12; $n=3$), FACT General Scale (FACT-G; $n=2$), World Health Organization Quality of Life Scale – Abbreviated Version (WHOQoL-Bref; $n=1$) and/or Patient Generated Index (PGI; $n=1$). There was also considerable diversity in the psychological variables examined and the assessment instruments used to measure them. Distress-related variables (i.e. depression, anxiety or combined distress scores) were the most commonly assessed psychological factors ($n=10$) and were measured using the HADS, Beck Depression Inventory (BDI), General Health Questionnaire (GHQ), Self-Rating Depression Scale (SDS) or Self-Rating Anxiety Scale (SAS). Coping was examined in six studies with the Coping Orientations to Problems Experienced (COPE), Brief COPE, Ways of Coping – Cancer Version (WOC-CV), Medical Coping Modes Questionnaire (MCMQ) or Freiburg Questionnaire on Coping with Illness (FCQI). Personality was assessed in five studies with the Eysenck Personality Inventory (EPI), Life Orientation Test – Revised (LOT-R) or Millon Behavioral Health Inventory (MBHI). HNC survivors' perceptions of the care they received was examined in four studies, using the Satisfaction with Information Profile (SCIP; $n=2$), the Social Support Questionnaire (SSQ; $n=1$) and three non-validated questions relating to perceived burden of care in the remaining study [39]. Fear of recurrence was assessed in two studies with two different unvalidated measures [24,38]. Two additional psychological variables were assessed in a single study each: body image using the Derriford Appearance Scale

(DAS24) and benefit-finding (i.e. seeking benefit from adverse experiences) using the Benefit Finding Scale (BFS).

All included studies demonstrated a significant relationship between at least one psychological factor and post-treatment QoL outcomes. Of the 15 articles describing 10 studies with prospective designs, only six articles describing five studies [21,23,27,30,33,34] reported longitudinal analyses in relation to psychological predictors of QoL (i.e. where the psychological factor was measured before the QoL outcome), while the other nine articles describing seven studies [20,22,25,32,35–38,43] reported only cross-sectional associations between psychological factors and QoL in the post-treatment period. The remaining nine articles describing nine studies [24,26,28,29,37,39–42] reported on cross-sectional associations between at least one psychological factor and post-treatment QoL outcomes.

Cross-sectional analyses

Distress-related variables

The cross-sectional relationship between depression and QoL was examined in five studies [24,28,32,36,42]. In each study, higher depression scores among HNC survivors were significantly associated with poorer QoL outcomes, including lower physical, mental and social functioning and higher generic and HNC-specific symptom scores in four studies [24,28,36,42]; lower emotional well-being in three studies [24,28,32]; and lower global or overall QoL in two studies [24,28]. Four studies also examined the relationship between anxiety and QoL among HNC survivors cross sectionally [28,30,36,42]. Higher levels of anxiety were associated with higher generic and HNC-specific symptom scores in three studies [28,36,42], lower social functioning in two studies [28,42], lower overall QoL in two studies [28,30] and lower physical functioning, mental functioning and emotional well-being scores in one study [28]. A significant interaction between anxiety and gender in relation to QoL among nasopharyngeal carcinoma survivors was observed in one study [30]; anxious females (who scored >11 on the anxiety subscale of the HADS) exhibited significantly lower QoL compared with non-anxious women, while anxious men did not display significantly lower QoL than non-anxious men. Finally, the relationship between distress (combined anxiety and depression scores) and QoL was examined in three studies [23,25,43]. Higher distress was significantly associated with higher HNC-specific symptom scores in all three studies [23,25,43] as well as lower physical functioning and emotional well-being scores and higher generic symptom scores in two studies [23,43].

Coping

Five studies examined associations between coping and QoL through cross-sectional analyses [20–23,26,30,37,38,40]. In two studies using the COPE, avoidance coping was

associated with poorer QoL outcomes, including lower functioning and global QoL [20–23,37,38] and higher generic and HNC-specific symptom scores [20–23], while problem-focused coping was associated with poorer functional QoL, general cancer symptom QoL and HNC-specific symptom QoL [20–23]. In one of these studies, 'drinking to cope' was negatively associated with global and functional QoL [21]; in the other, coping through humour was negatively associated with functional QoL outcomes and positively associated with general and HNC-specific symptoms [22]. In a study using the MCMQ [30], lower confrontation coping was associated with poorer total QoL scores. Another study found that all five patterns of coping from the WOC-CV (seeking or using social support, distancing, cognitive escape-avoidance, behavioural escape-avoidance and focusing on the positive) were associated with poorer QoL outcomes among laryngectomy survivors [26]. Finally, one study [40] found that 'depressive coping' measured with the FCQI had a significant negative association with overall QoL.

Personality

Two studies assessed personality using the EPI [20–23,37,38]. In both studies, cross-sectional analyses indicated that high neuroticism scores were associated with poorer QoL outcomes in all domains of both EORTC QoL scales. Additionally, in both studies, greater neuroticism was a significant independent predictor of lower functional QoL and higher HNC-specific symptoms [21,23].

Perceptions of care received

Four studies examined the relationship between QoL and variables, which measured HNC survivors' perceptions of the care they received, specifically, survivors' satisfaction with their care [33,34], perceived burden on carers [39] and satisfaction with the social support they received [29]. The findings of two articles derived from the same study [33,34] indicated that higher levels of patient satisfaction with information on illness and treatment measured before and after treatment predicted better mental functioning QoL. In another study [39], a range of variables measuring survivors' perceptions of the burden of care they placed on their caregiver were related to poorer functional QoL outcomes; that is, patients with poorer functioning felt they were a greater burden on their carers. Finally, in one study [29], a combination of greater satisfaction with social support (as measured by the SSQ) and lower premorbid pessimism (as measured by the MBHI) predicted higher social/family well-being among this cohort.

Fear of recurrence

Fear of recurrence and QoL were assessed in cross-sectional analyses in two studies [27,41]. In one study, greater FoR (assessed using a single item) was significantly associated with lower overall QoL [41]. In the other, greater FoR (assessed using a seven-item questionnaire) was associated with lower social and emotional functioning [27].

Other psychological factors

In one study [31], greater body image concerns were associated with poorer QoL in all domains of the UW-QoL. One further study [35] found that the emotional and spiritual growth item in the benefit-finding scale (i.e. deriving emotional or spiritual growth from HNC) was associated with higher levels of mental health-related QoL.

Longitudinal analyses

Five studies [21,23,27,30,33,34] provided longitudinal analyses of psychological factors and QoL. Two of these studies examined the relationship between anxiety (measured by the HADS) and subsequent QoL. In one study [30], HNC survivors with high levels of anxiety before radiotherapy had the greatest decline in QoL following treatment. The other study [34] found that anxiety, optimism (measured by the LOT-R) and patient satisfaction at diagnosis predicted mental functioning QoL scores 6–8 months following treatment. The longitudinal association between distress and QoL was also examined in one study [23]; distress levels (measured by the GHQ) at least 1 year post-treatment were associated with poor QoL outcomes among HNC survivors 3 years later. Two studies [21,23] investigated the relationship between personality and coping (measured by the EPI and COPE, respectively) after treatment and subsequent QoL outcomes. Both studies reported that higher levels of neuroticism, problem-focused coping and avoidance-focused coping immediately after treatment predicted lower functional and global QoL and higher generic and HNC-specific symptoms 3 or more years later. One of these studies [21] also found that 'drinking to cope' and 'coping by humour' measured 4 years post-treatment were associated with poor QoL outcomes up to 4 years later. One additional study, which examined the longitudinal relationship between coping and QoL, found that acceptance coping at diagnosis (measured by the Brief COPE) predicted global QoL 6–8 months following treatment when combined with tumour stage and pre-treatment QoL [34]. Two studies [33,34] found that higher levels of patient satisfaction at diagnosis (measured by SCIP) predicted better mental functioning QoL 6–8 months following treatment. Finally, one study [27] found that an increase in FoR from an initial post-treatment visit to approximately 7 months later was associated with worsening anxiety-related QoL scores at least 7 months later.

Quality assessment

The quality assessment is summarised in Table 1 (with further details in Table S2). Eight articles were scored as

'good quality', 15 were rated as 'adequate quality' and one was rated as 'poor quality'. Areas in which articles scored poorly included failure to justify sample size, not having a control group, not justifying statistical practices (e.g. dichotomizing scores on psychological variables into binary predictors without providing a rationale) and poor descriptions of the population, design, recruitment strategy and characteristics of non-responders/non-participants.

Conclusions

The current review builds on the findings of a prior systematic review [15] to demonstrate that several key psychological factors significantly predict QoL among HNC survivors. As observed previously, depression and neuroticism were important predictors of negative QoL outcomes in HNC research published in the last 10 years. The current review extends the findings of this previous review by providing evidence that anxiety, distress, FoR and coping style are also strongly associated with poor QoL outcomes among HNC survivors following treatment. In line with this prior review [15], two measures of perceptions of care received, patient satisfaction [41,42] and satisfaction with social support [29], were also associated with positive QoL outcomes. However, the limited evidence available suggests that further investigation of these associations is warranted. Some limited data from individual studies also suggest that other psychological variables such as body image [31], benefit-finding [35] and perceived burden of care [39] may have significant associations with QoL. These findings, together with the wider body of literature on these variables [e.g. 44–46], suggest promising avenues for further research and the potential for future intervention development among HNC survivors. In particular, it is likely that body image may be an important predictor of QoL outcomes among this cohort given the potential for visible disfigurement following HNC treatment. Nonetheless, the quality assessment indicated a number of shortcomings in many studies, including limited description of the population, design and recruitment strategies, limited justification of statistical practices and potential bias in the reporting of significant findings; suggesting that, a decade on from the review of Llewellyn *et al.* [15], there remains limited high-quality research investigating the psychological factors that predict QoL among HNC survivors. Furthermore, the findings from the quality assessment mean that the study results should be interpreted with caution and care taken when considering the full implications of the findings described herein.

In this review, distress-related variables were consistently associated with poorer QoL outcomes among post-treatment HNC survivors in cross-sectional and longitudinal analyses. Prior to 2005, research investigating the impact of distress-related variables on QoL in HNC typically focused on depression [15], and variables such as anxiety and emotional distress had rarely been examined. Consistent with the findings of this research, in the current review, depression was associated with poorer QoL outcomes in cross-sectional analyses [24,28,32,36,42]. A novel finding of this review is that higher anxiety levels were similarly associated with a range of poorer QoL outcomes across five studies [28,30,34,36,42], and distress (combined anxiety and depression scores) was associated with impaired QoL among HNC survivors in three studies [22,25,43]. These findings are consistent with the broader cancer survivorship literature, where both depression and anxiety have been associated with lower QoL among diverse groups of cancer survivors including those with breast, colorectal and lung cancer [47–49]. However, it should be noted that clinical assessments of depression, anxiety and/or distress were not undertaken in these studies. In line with recommendations from prior systematic reviews and clinical guidelines for HNC care pathways [50–53], routine clinical screening for both depression and anxiety (or distress) by practitioners could enable the identification of individuals at risk for poorer QoL outcomes following HNC treatment and who might benefit from intervention and/or support. In particular, while depression and anxiety are known to occur at all stages of the disease trajectory among HNC survivors [6], it may be important to identify individuals who exhibit clinical symptoms of distress post-treatment and may benefit from formal psychological support [50].

A further novel finding of the current review is the presence of strong negative associations between FoR and post-treatment QoL outcomes across two studies [27,43]. FoR represents a particularly important area for study among this survivor population given that recurrence risk is high in HNC [54–56]. While the current findings need replication in larger populations, employing more standardised and psychometrically robust measures of this construct (such as the Fear of Progression Questionnaire or the shorter Assessment of Survivor Concerns Scale [57]) would also be useful. It has been estimated that between half and three-quarters of this population have concerns about recurrence [6]. Interventions that target the management of FoR concerns (e.g. through active emotion-focused and behavioural strategies to manage uncertainty fears) may increase QoL among HNC survivors where recurrence fears have become intrusive [58,59]. Indeed, such interventions have been successful among other groups of cancer survivors [e.g. 59].

This review also reveals a striking negative relationship between the use of specific coping strategies and QoL outcomes among HNC survivors. Indeed, a range of both active (coping with humour, seeking or using social support, focusing on the positive and acceptance coping)

and avoidant coping strategies (coping by suppression of competing activities, coping by behavioural avoidance, drinking to cope, cognitive escape-avoidance, behavioural escape-avoidance, low confrontation coping and depressive coping) were associated with poorer QoL outcomes among HNC survivors in both cross-sectional and longitudinal analyses [20–23,26,30,34,37,38,40]. It is unclear exactly why both active and avoidant coping strategies are associated with poorer QoL outcomes among HNC survivors, but interestingly, similar associations have been reported among prostate cancer survivors (e.g. [60,61]). Aarstad et al. [21] propose that such findings may indicate that HNC survivors who perceive they have poorer QoL employ more attempts to cope with these challenges, thereby more vigorously applying a variety of coping strategies. While this cannot explain longitudinal associations between active and avoidant coping strategies and subsequent QoL, it should be noted that the two studies in the current review, which examined longitudinal associations between active and avoidant coping strategies and QoL [21,23], did not measure coping strategies at more than one time point, and it is possible that coping strategies employed by HNC survivors may change over time. Because emerging research has indicated that the QoL of HNC survivors may stabilise or improve beyond baseline levels approximately 5 years after HNC treatment [62,63] or may deteriorate over time due to late effects [64,65], it would be useful to establish whether individual active and avoidant coping strategies interact with QoL outcomes over time in order to identify time points across the post-treatment trajectory when interventions to improve HNC survivors' coping skills would be most appropriate.

The findings from the studies included in this review give a somewhat more limited picture of the relationship between personality variables and QoL. Neuroticism was associated with lower QoL outcomes in both cross-sectional and longitudinal analyses across two studies from a Norwegian research group [21–23,37,38]. Together with the findings of the review of Llewellyn et al. [15], these results point towards a consistent association between neuroticism and poor QoL outcomes among HNC survivors. In terms of potential explanations for this relationship, neuroticism is typically associated with more negative health perceptions generally (e.g. [66–68]). In one study [34], optimism measured at diagnosis was associated with improved mental functioning QoL following treatment. However, other personality variables such as agreeableness, conscientiousness and impulsivity have not been investigated, suggesting that further research is needed to identify whether additional personality factors such as these may affect the QoL of HNC survivors following treatment.

A major finding of the current review is the wide heterogeneity in measurement, sampling and design between studies; indeed, the heterogeneity was so great as to preclude formal statistical combination of the studies. In general, there was great diversity in QoL measures used, and these different QoL measures incorporate specific sub-domains of QoL, which cannot be easily compared as they may be tapping into different aspects of QoL. There is currently no recognised gold standard measure for QoL in HNC [10]; future research would benefit from the development of more standardised approaches to QoL measurement among this population. There was also diversity in the sample size and composition of included studies. Notably, sample sizes were relatively small, with the largest study including less than 400 participants. Furthermore, recruitment strategies were not documented in many studies and most recruited from single (or a small number) of clinics, raising the possibility that results may not be generalizable to the wider population of HNC survivors. Larger population-based studies investigating the psychological factors that predict QoL outcomes among HNC survivors are needed to establish the veracity of the findings described herein, to ensure adequate power and enable informative analyses of HNC subgroups or interactions between psychological and other predictors of QoL. Finally, it should be noted that several studies included in the current review reported only modest associations between psychological variables and QoL. Greater efforts should be made in future studies to provide further information on design and recruitment strategies, justify statistical practices, discuss non-significant findings in detail and clarify the strength of associations between psychological variables and QoL in order to enhance their replicability and demonstrate that they are free from bias.

While this review has identified important directions for future HNC survivorship research and intervention development, it has a number of limitations. Firstly, the review is limited to studies published in the English language. There may be additional relevant research that has been published in other languages. Additionally, this review is restricted to examining psychological predictors of QoL in the post-treatment period alone, and the findings may not apply to HNC patients undergoing or awaiting treatment. However, a wealth of evidence suggests that the post-primary treatment phase is a unique period of intense vulnerability for HNC survivors, characterised by lower QoL [5,6,11], and thus merits individual attention.

In conclusion, this review shows that there are strong negative associations between distress-related variables and the QoL of HNC survivors following their treatment. Interventions to reduce distress may help to improve HNC survivors' QoL, and routine screening for distress may identify those at risk for poor QoL in this period. However, there is a need for further longitudinal and population-based studies, which take more systematic and standardised measurement approaches to better understand the relationship between QoL and other

psychological variables among post-treatment HNC survivors. Such studies could inform the development of interventions and supportive care strategies to improve QoL in this population.

Notes

1. In clinical practice, QoL typically refers to health-related QoL, which comprises aspects of QoL related to health or medical concerns, and measures physical, psychological and social domains [15]. For this review, we have opted for the more general term 'quality of life', which may refer to both QoL and health-related QoL, as these terms are often used interchangeably in the literature.

2. Studies were classified as prospective if at least one psychological factor was measured at a time point that preceded the QoL measurement.

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