

The impact of influenza-like illness in young children on their parents: a quality of life survey

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Abstract

Background Influenza-like illness can cause excess paediatric morbidity and burden on parents.

Objectives We determined the quality of life (QoL) impact of children's influenza-like illness (ILI) on their parents.

Methods We conducted a prospective cohort study in childcare centres and a general practice in Sydney, Australia. Using PAR-ENT-QoL, we measured QoL of parents of children aged 6 months–3 years before the 2010 influenza season, then again for parents of children with ILI (ILI group) using SF-12v2 Acute Form and PAR-ENT-QoL, and contemporaneously for parents of aged-matched children without ILI (non-ILI group).

Results Of 381 children enrolled from 90 childcare centres, 105 developed ILI. PAR-ENT-QoL scores of the ILI group were significantly lower in the post-ILI follow-up interviews than at baseline (60.99 vs. 79.77, $p < 0.001$), and those of non-ILI group at follow-up interviews (60.99 vs. 84.05, $p < 0.001$). SF-12v2 scores of the ILI group were also significantly lower than those of non-ILI group: physical component summary (50.66 vs. 53.16, $p = 0.011$) and mental component summary (45.67 vs. 53.66, $p < 0.001$). Two factors were significantly associated with parental QoL: total time spent caring child during ILI and whether the child had severe ILI or not. Correlations between PAR-ENT-QoL and SF-12v2 scores were satisfactory.

Conclusions Parents had significantly lower QoL while their child had ILI, compared with before ILI and with parents of children without ILI. The public health impact of ILI in children on the QoL in families is far from negligible. QoL measurement can complement economic evaluation of ILI disease burden and provide a more complete picture of impact.

Keywords Parent · Children · Influenza-like illness · Quality of life · Survey

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Introduction

Influenza can cause excess paediatric morbidity, and the clinical disease burden of childhood influenza has been well described [1]. Influenza-like illness (ILI), usually defined as having fever and one or more of the following respiratory symptoms: runny nose, sore throat, or cough [2]. ILI can be caused by influenza virus, respiratory syncytial virus, human metapneumovirus, coronavirus, rhinovirus, adenovirus, and other respiratory viruses [3]. It is

considered to be a valid proxy of influenza activity [4], and as many as 30–40 % of school-aged children develop ILI during each influenza season [5, 6]. Only about 5 % of children with laboratory-confirmed influenza who seek medical consultation are hospitalised, which signifies that the majority are outpatient cases being cared for in the home [5–7]. Children attending childcare centres have a greater risk of acute respiratory infections [8–10].

The economic impact of children's ILI and influenza on the community is likely to be substantial [11–13]. Prospective cohort studies conducted in, for example, the USA, Italy, and Finland, have found that parents and siblings of influenza-infected children experience considerable loss in working and school days [14–17]. In Australia, caregivers of children with ILI lost on average 13 hours of work and 3 hours of leisure time per episode [18]. In a large tertiary hospital in Australia, one-third of children who were hospitalised for laboratory-confirmed influenza had at least one other family member develop similar symptoms within one week of the child's hospitalisation; the child's illness also resulted in an average of 3.2 days of work absenteeism for parents [19].

While many studies have investigated the health impact of influenza in children and some have investigated the economic impact, no published studies have attempted to quantify the quality of life impact on the caregivers of children. The intangible costs of influenza, including inability to undertake normal activities, loss of leisure time, psychological impact, and social disruption, are likely to be considerable [20–22]. They are collectively grouped under a term called "Quality of life" (QoL), which is defined by the World Health Organization as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns" [23]. The disease burden of ILI can be more comprehensively estimated if we consider the parental QoL in addition to evaluating the economic and hospitalisation data.

The aim of this study was to explore the psychosocial impact of a children's ILI on their families, through measuring parental QoL. The two main hypotheses of this study are that parents/caregivers of children: (1) had lower QoL when their child had ILI than before they had ILI; and (2) had lower QoL when their child had ILI than other parents/caregivers of children without ILI during the influenza season.

Methods

Study design and participants

This assessment of the impact of a child's ILI on parents was part of a prospective cohort study investigating the medical,

economic, and social benefits of influenza vaccination of children in formal childcare. This study was conducted during the Southern Hemisphere influenza season in 2010 (March to November). Study researchers visited 90 childcare centres and one paediatric-focused GP practice in Sydney, Australia, and explained the study to the parents of children aged 6 months–3 years. Telephone numbers of interested parents were obtained, and researchers phoned them within a week to further explain the study. Interested parents whose children were eligible for the study and who had returned the consent form were then enrolled over the phone. The children were healthy without chronic illness, egg allergy, history of Guillain–Barré syndrome, or haematological disorders. The majority were recruited before or early in the influenza season.

The parents were contacted weekly during the influenza season, by mail, text message, or phone call, to remind them to call the researchers if their enrolled child developed any ILI: fever ≥ 37.8 °C or feverishness according to the caregiver's judgement, plus runny nose, or sore throat or cough [2]. Since no standard definition of ILI was available, this definition was adapted from Lambert et al.'s study, which was conducted in a similar setting to our study [2, 24]. Parents of children meeting the definition were asked to collect nose and/or throat swabs, which were sent to a laboratory for testing [18]. Figure 1 shows the recruitment and data collection process.

Questionnaires

We conducted a systematic review to identify existing disease-specific QoL instruments for caregivers suitable for our purpose [25]. No ILI-specific instruments were available, so we chose to use PAR-ENT-QoL [26], a questionnaire for caregivers of children with ear–nose–throat (ENT) infections or rhinopharyngitis. We used PAR-ENT-QoL for the baseline, and both PAR-ENT-QoL and SF-12v2 Acute Form [27], a generic QoL questionnaire for adults, for follow-up and non-ILI interviews.

The PAR-ENT-QoL questionnaire has been shown to have good construct validity and internal consistency [26]. Although PAR-ENT-QoL has not been used in caregivers of children with ILI, it was chosen in view of the similarity of symptoms in ENT infections/rhinopharyngitis and ILI. PAR-ENT-QoL was developed in French and has been culturally adapted in Italian, German, Portuguese, and Czech [25, 26]. We used the English version of PAR-ENT-QoL provided by the questionnaire developers; however, this version had not yet been validated at the time of our study. The PAR-ENT-QoL questionnaire has 15 items regarding the extent of parents' worry, stress, mood, quality of sleep, time for family members, outings and leisure, medical expenses, and perceived QoL in general

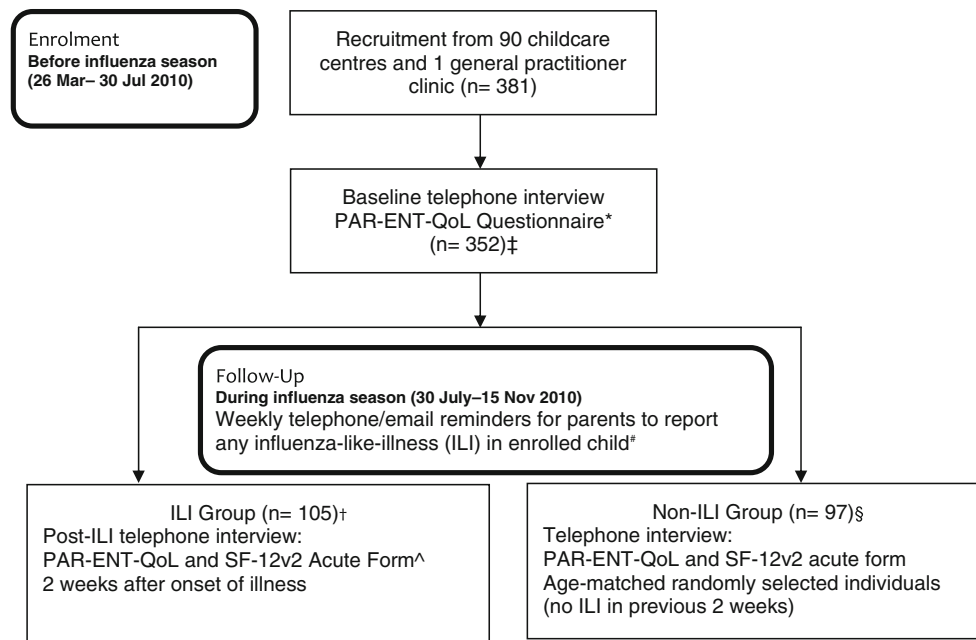


Fig. 1 Flow diagram showing recruitment and data collection process in cohort study during Southern Hemisphere influenza season, Sydney, Australia, 2010. *Questionnaire for caregivers of children with ear–nose–throat infections or rhinopharyngitis. ‡Missing data from 29 subjects recruited in the beginning of the influenza season where baseline interview was not possible. #fever ≥ 37.8 °C or feverishness, plus runny nose or sore throat or cough [24]. †The 105

children had 124 ILI episodes (89 children had 1 episode, 13 had 2 episodes, and 3 had 3 episodes). ^A generic QoL questionnaire for adults. §Randomly selected from study participants who did not have ILI in the preceding 2 weeks. The sample size of non-ILI group (n = 97) does not match the ILI group (n = 105) because some children from non-ILI group developed ILI later on and they were grouped into the ILI group

during the preceding 2 weeks. Items were rated using a five-point Likert scale, and ratings were then reversed so that the scoring direction was consistent with the SF-12v2 Acute Form (i.e. a higher score represented better QoL). The items in the PAR-ENT-QoL questionnaire are categorised in two domains (Emotional and Daily Disturbance); the domain scores were calculated by adding up the scores (1–5) of items from the corresponding domain. The domain scores were then linearly transformed (ranging from 0 to 100). The Total score was calculated by adding up the two domain scores and dividing by two [26].

The SF-12v2 Acute Form has 12 items with three-point or five-point Likert scales. The SF-12v2 Acute Form is similar to the standard SF-12v2, the only difference being that it has a one-week recall period instead of 4 weeks. It covers eight domains: physical functioning (moderate activity, climbing stairs); role physical (accomplished less, limited in activities); bodily pain; general health; vitality (lot of energy); social functioning (interference in social activities); role emotional (accomplished less, less careful); and mental health (felt calm, downhearted). The scores for the first four domains were grouped into a “physical component summary”, and the scores for the last four domains were grouped into a “mental component summary” [27]. The raw scores obtained were linearly z-score transformed into a 0–100 scale using this formula: [(actual

raw score–lowest possible raw score)/possible raw score range] $\times 100$, such that the transformation converts the lowest and highest possible scores to 0 and 100, respectively [27]. A higher score indicated a higher QoL. The SF-12v2 Acute Form domain and summary scores were converted to norm-based scores using software from the Medical Outcomes Trust and QualityMetric Incorporated. This allows direct comparisons with the 1998 general US population, which has a mean score of 50 and a standard deviation of 10.

Interviews

Before the influenza season started, parents of enrolled children were interviewed by trained interviewers via telephone using the PAR-ENT-QoL questionnaire [26] (baseline). Parents who reported that their child had ILI were interviewed by telephone approximately 2 weeks (10–16 days) after onset of the child’s ILI using both PAR-ENT-QoL and SF-12v2 Acute Form (Licence agreement invoice number: SI023009) [27] (ILI group). Parents were asked details about the child’s ILI: nature and duration of symptoms, within household spread of ILI, perceived severity of their child’s ILI, disruption of household members’ work time and leisure, healthcare costs (results reported elsewhere [18]), and other demographic factors.

At the time of each follow-up interview, we interviewed another parent of an age-matched randomly selected child who had not had ILI in the preceding 2 weeks (non-ILI group) using the same questionnaires. Interviewers were not blinded to the outcome (i.e. ILI).

Data analysis

We used SPSS version 18.0 to analyse the data. Descriptive statistics were used to characterise demographic data and QoL score distribution. Caregivers of children who had one ILI episode or more at any time during the study period were considered to be in the ILI group.

PAR-ENT-QoL and SF-12v2 Acute Form scores

Baseline PAR-ENT-QoL scores of the ILI and non-ILI groups were compared using the independent *t* test. For parents in the ILI group, PAR-ENT-QoL scores from the follow-up interviews were compared with baseline scores using the dependent *t* test. We hypothesised that the follow-up interview scores in this group should be significantly lower than the baseline scores. Similarly, for parents in the non-ILI group, PAR-ENT-QoL scores from the follow-up interviews were compared with baseline scores using the dependent *t* test. We hypothesised that the scores should not be significantly different. After follow-up interviews, the PAR-ENT-QoL and SF-12v2 Acute Form scores of the ILI and non-ILI groups were compared using the dependent *t* test. We hypothesised that the scores should be lower in the ILI group. We used the dependent *t* test to compare any differences in PAR-ENT-QoL scores for parents whose child had more than one ILI episode. This serves as a reliability test to further confirm that the QoL change is due to ILI and not any other factors.

Factors associated with parental QoL

We determined the factors associated with PAR-ENT-QoL scores by constructing scatter plots to determine whether the scores were linearly distributed, and then correlating the factors and the scores. We used Pearson's correlation for factors that were continuous and Spearman's rho for factors that were ordinal or dichotomous. Variables that yielded a *p* value of <0.25 were put into a multiple regression model. We checked to confirm that the factors were not collinear and that the data were normally distributed and linear before interpreting the results.

Validity and reliability of PAR-ENT-QoL

Since no ILI-specific QoL instruments were available, PAR-ENT-QoL was chosen in the light of the similarity in

Table 1 Characteristics of parent and child participants (*n* = 381) and their experiences by the presence of influenza-like illness (ILI) episode

	Number (%)	
	Children who had ILI (<i>n</i> = 105)	Children who had not had ILI (<i>n</i> = 276)
Interviewee's relationship with child		
Father	5 (5)	15 (5)
Mother	100 (95)	261 (95)
Parents' age	Range	Range 21–51 years
	Mean 36; SD 4.1 years	Mean 36; SD 4.3 years
20–<24	0 (0)	5 (2)
25–<30	9 (9)	16 (6)
30–<35	36 (34)	80 (29)
35–<40	47 (45)	126 (46)
40–<45	12 (11)	43 (16)
50–<55	1 (1)	1 (0.4)
Missing	0 (0)	1 (0.4)
Parents' education level		
Below university	21 (20)	89 (32)
University or above	83 (79)	186 (67)
Missing	1 (1)	1 (0.4)
Weekly household income (AUD)		
Below < \$1,000	1 (1)	9 (3)
\$1,000–\$1,999	19 (18)	57 (21)
\$2,000–\$2,999	59 (56)	123 (45)
\$3,000 or above	22 (21)	60 (22)
Missing	4 (4)	27 (10)
Household employment status		
Both parents working	79 (75)	199 (72)
Mother on maternal leave	6 (6)	12 (4)
Only one parent working	19 (18)	62 (23)
Both parents not working	0 (0)	3 (1)
Missing	1 (1)	0 (0)
Child gender		
Male	52 (50)	156 (57)
Female	53 (50)	120 (44)
Child age (months)	Range	Range 11–41 months
	Mean 26; SD 8.5 months	Mean 28; SD 7.7 months
0–11	2 (2)	2 (1)
12–23	42 (40)	88 (32)
24–35	45 (43)	132 (48)
36 or above	15 (14)	52 (19)
Attends childcare		
Yes	95 (90)	245 (89)

Table 1 continued

	Number (%)	
	Children who had ILI (<i>n</i> = 105)	Children who had not had ILI (<i>n</i> = 276)
No	10 (10)	31 (11)
Childcare centre attendance (days per week)	Mean 2.8	Mean 2.8
1	10 (10)	32 (12)
2	38 (36)	76 (28)
3	23 (22)	75 (27)
4	11 (10)	23 (8)
5	13 (12)	39 (14)
Not applicable	10 (10)	31 (11)
Total ILI episode(s) of child		
1	89 (85)	–
2	13 (12)	–
3	3 (3)	–
Child's ILI duration (days)		
1–7	45 (43)	–
8–14	37 (36)	–
15–21	6 (6)	–
22–28	4 (4)	–
>28	12 (12)	–
Parents' perceived severity of child's illness (first episode only)		
Mildly sick	39 (37)	–
Fairly sick	47 (45)	–
Very sick	18 (17)	–
Missing	1 (0.4)	–

Percentages sometimes do not add up to 100 % due to rounding

disease symptoms. It has not been used in the ILI setting before, and therefore, we explored the validity of PAR-ENT-QoL in this setting by correlating its scores with SF-12v2 Acute Form scores using Pearson's correlations. We determined the reliability by internal consistency using Cronbach's alphas.

Ethics approval was granted by the Human Research Ethics Committee of The Children's Hospital at Westmead, Sydney, Australia (project number: 2007/017).

Results

Demographics

Of 381 children enrolled, 340 were enrolled through childcare centres and 41 through GP clinics. There were 124 ILI episodes in 105 children: 5 children had influenza A(H1N1), 39 had adenovirus, 39 had rhinovirus, 22 had parainfluenza virus type 3, and the rest had other

Table 2 Pearson's correlation coefficients of domain and total scores of PAR-ENT-QoL^a and SF-12v2 Acute Form^b

SF-12v2	PARE-ENT-QoL		
	Emotional	Daily disturbance	Total
Physical functioning	–	0.241 [‡]	0.238 [‡]
Role physical	–	0.442[§]	0.467[§]
Bodily pain	–	0.122	0.117
General health	–	0.181 [*]	0.170
Vitality	0.447[§]	–	0.482[§]
Social functioning	0.501[§]	–	0.564[§]
Role emotional	0.450[§]	–	0.538[§]
Mental health	0.481[§]	–	0.467[§]
Physical component summary	–	0.154	0.143
Mental component summary	0.536[§]	–	0.582[§]

A generic QoL questionnaire for adults

* $p \leq 0.05$; [‡] $p \leq 0.01$; [§] $p \leq 0.001$; correlations >0.3 are in bold

^a Questionnaire for caregivers of children with ear–nose–throat infections or rhinopharyngitis

^b A generic QoL questionnaire for adults

respiratory viruses [28]. The majority of ILI cases (74 %) resolved within 2 weeks. Table 1 shows the demographics of the parents and their children and describes the ILI episodes. The demographics of the parents and their children were not significantly different in the ILI and non-ILI group.

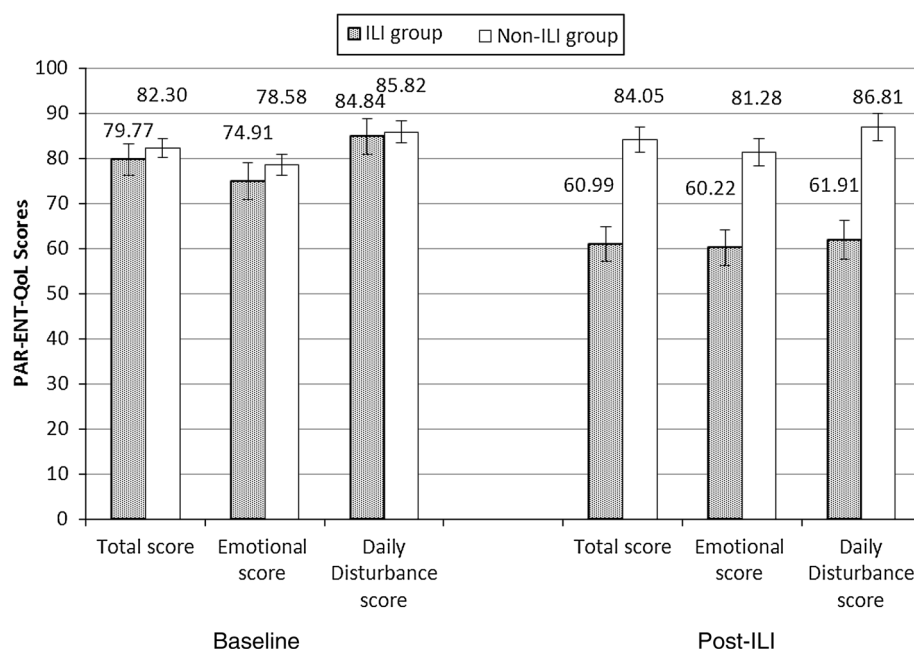
Validity and reliability of PAR-ENT-QoL

Table 2 shows the correlations between PAR-ENT-QoL and SF-12v2 Acute Form scores. The Total scores for PAR-ENT-QoL had a strong correlation with the mental component summary of SF-12v2 Acute Form ($r = 0.58$, $p < 0.001$) and a weak correlation with the physical component summary ($r = 0.14$, $p = 0.2$). The Emotional domain of PAR-ENT-QoL correlated strongly with the mental component domains of SF-12v2 Acute Form ($r = 0.45–0.54$, $p = <0.001$). The Daily Disturbance domain, however, correlated weakly to moderately with the corresponding domains in SF-12v2 Acute Form ($r = 0.12–0.44$, $p = <0.001–0.19$). The Emotional and Daily Disturbance domains of PAR-ENT-QoL had good internal consistencies, with Cronbach's alphas of 0.87 and 0.84, respectively.

PAR-ENT-QoL scores

Of the 381 children recruited, 29 parents of these children were not interviewed at baseline, because they were recruited in the beginning of the influenza season which the follow-up period has already commenced. Baseline scores

Fig. 2 Mean total and domain PAR-ENT-QoL* scores of influenza-like illness (ILI) and non-ILI groups at baseline and post-ILI interviews. *Note* individuals in ILI and non-ILI groups were not known yet in baseline, they were categorised only in post-ILI. *Questionnaire for caregivers of children with ear–nose–throat infections or rhinopharyngitis



in the ILI group and non-ILI group were not significantly different (Fig. 2), signifying that before the influenza season started, parents of all enrolled children had similar QoL. Scores in the ILI group at post-ILI follow-up interviews were significantly lower than at baseline (Fig. 2): Total score 60.99 (follow-up) versus 79.77 (baseline) ($p < 0.001$); Emotional score 60.22 versus 74.91 ($p < 0.001$); and Daily Disturbance score 61.91 versus 84.84 ($p < 0.001$). This indicates that parents had a significantly lower QoL while their child had ILI compared to before the ILI episode. Scores in the non-ILI group at baseline and at follow-up were not significantly different (Fig. 2). This means that parents of children who did not have ILI had similar QoL before and during the influenza season. At follow-up interviews, parents of children with ILI had significantly lower QoL than parents of children without ILI (Fig. 2): Total score 60.99, SD = 21.38 (ILI group) versus 84.05, SD = 15.11 (non-ILI group) ($p < 0.001$); Emotional score 60.22 versus 81.28 ($p < 0.001$); and Daily Disturbance score 61.91 versus 86.81 ($p < 0.001$).

Among parents of children with more than one ILI episode ($n = 16$), comparison of PAR-ENT-QoL scores after the first two ILI episodes showed that the QoL scores were not significantly different between episodes: Total score 58.61 (first episode) versus 55.53 (second episode) ($p = 0.60$); Emotional score 59.86 versus 53.37 ($p = 0.26$); and Daily Disturbance score 58.33 versus 57.74 ($p = 0.93$). This signifies that the QoL impact on parents was similar for each ILI episode. The first five items parents rated as having the greatest impact (lowest QoL) from PAR-ENT-QoL were the following: “woke up

during the night” (mean score: 2.66); “quality of employment and housework” (3.21); “stressed” (3.22); “worried” (3.28); and “reduce outings and leisure” (3.31). The items covered both Emotional and Daily Disturbance domains.

SF-12v2 Acute Form scores

Figure 3 shows the SF-12v2 Acute Form scores of the ILI and non-ILI groups during the follow-up period. A score under 50 represents a health status below average according to the 1998 US population [27]. The following domains and components showed significant score differences between the ILI and non-ILI groups: “role physical” (mean: ILI group 46.50 vs. non-ILI group 53.16, $p < 0.001$); “bodily pain” (49.04 vs. 53.53, $p = 0.001$); “vitality” (48.17 vs. 55.85, $p < 0.001$); “social functioning” (45.12 vs. 52.74, $p < 0.001$); “role emotional” (45.95 vs. 52.19, $p < 0.001$); “mental health” (48.46 vs. 54.77, $p < 0.001$); “physical component summary” (50.66 vs. 53.16, $p = 0.011$); and “mental component summary” (45.67 vs. 53.66, $p < 0.001$).

Factors associated with parental QoL

Table 3 shows the correlations of demographic factors or characteristics with PAR-ENT-QoL Total scores of the ILI group at follow-up. The factors in the multivariate regression model explained 25.5 % of the variance. Of the five factors in the model, two were significantly associated with “PAR-ENT-QoL Total scores”, they were: “total time spent caring for the child during ILI” ($\beta = -0.24$,

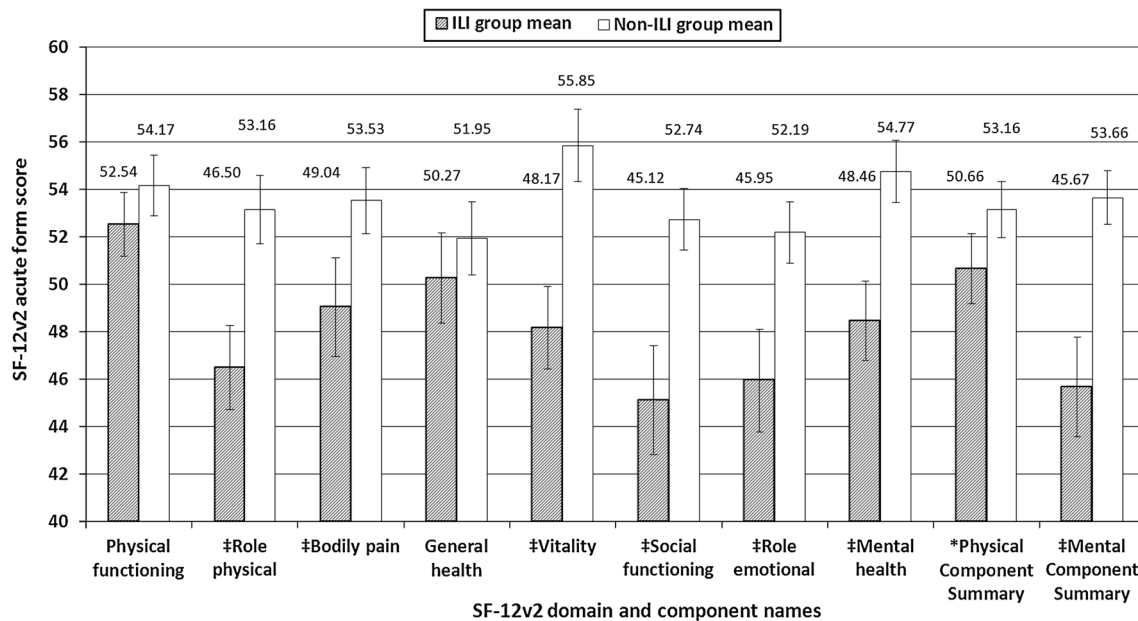


Fig. 3 SF-12v2 Acute Form ^ domain and component scores in influenza-like illness (ILI) and non-ILI groups in the post-ILI period. Scoring under 50 represents a health status below average (1998 US population as reference). First four domains contribute to physical

component summary, last four domains contribute to mental component summary. ^A generic QoL questionnaire for adults. * p value ≤ 0.05 ; ‡ p value ≤ 0.001

$p = 0.03$), and whether the child had “severe ILI or not” ($\beta = 0.20$, $p = 0.04$). For every increase of 10.4 h in total time spent caring for the child during ILI, the PAR-ENT-QoL Total score decreased by 0.24 SD units.

Discussion

As expected, we have shown that parents had significantly lower QoL while their child had ILI, compared with before their child had ILI and compared with parents of children without ILI. Affected aspects included emotions and social life. Findings from the SF-12v2 Acute Form also demonstrated that when a child has ILI, the emotional component of the parent’s QoL was worse than that of the general US population in 1998 [27], whereas when a child did not have ILI, the emotional and physical components of the parent’s QoL were better than those of the US population in 1998 [27]. Significant physical impact on QoL was also observed but to a lesser extent than emotional impact, findings supported by both PAR-ENT-QoL and the SF-12v2 Acute Form. We did not observe significant differences in QoL during the first and second ILI episodes for parents of children having more than one ILI episode. However, given that there were only 16 children with more than one ILI episode, the similar extent of QoL impact in those with one ILI episode versus multiple episodes may be due to chance only.

Factors associated with lower parental QoL were the increased total time spent by parents in looking after the

sick child and that the child had severe ILI (as perceived by the parents). This was to be expected as parents having to spend more time to care for the child, or the child’s ILI being severe, would be more disruptive to normal routines; for example, sleep disturbances and reduced social activities were among the factors rated by parents as having the largest impact on parental QoL. Another study has shown a decrease in parental QoL if the child’s community-acquired pneumonia was more severe [29]. Demographic factors of the parent and the child with ILI were not associated with QoL. The total variance explained in the regression model, however, was not high (25 %), suggesting that QoL could be a complex concept influenced by many factors, which would require more in-depth analysis of parents’ QoL changes resulting from their experiences.

While there are numerous QoL studies of caregivers of chronically ill children, such as those suffering from dermatitis [30], cancer [31], or asthma [32], few QoL studies related to acute infectious diseases have been conducted (the studies we identified related to acute otitis media [33], ENT infections and rhinopharyngitis [26, 34], and community-acquired pneumonia [29]). We know of no published studies on the QoL of caregivers of children with ILI or influenza. Yet, children with influenza are at risk of developing complications such as otitis media and pneumonia [5]. Three studies have shown the negative impact of otitis media and community-acquired pneumonia on parental stress and family functioning [29, 35, 36]. The types of impact and the extent are consistent with what we

Table 3 Correlations of demographic factors or characteristics with PAR-ENT-QoL^a total scores of the influenza-like illness (ILI) group at post-ILI follow-up interviews

Demographic factors or characteristics	Univariate analysis		Multiple regression	
	Pearson's correlation/ Spearman's rho	<i>p</i> value	β	<i>p</i> value
Total time caring for child during ILI (in hours)	-0.396	<0.001	-0.24	0.03
ILI episode classified as severe ^b (0 = not severe, 1 = severe)	0.266	0.007	0.20	0.04
Perceived child's illness severity (1 = Mildly sick, 2 = Fairly sick, 3 = Very sick)	-0.386	<0.001	-0.191	0.07
Number of general practitioner visits	-0.307	0.002	-0.02	0.86
Intrafamilial spread (0 = No, 1 = Yes)	-0.244	0.013	-0.133	0.15
Presence of otitis media (0 = No, 1 = Yes)	-0.078	0.432	-	-
Education level (0 = Below university, 1 = University of above)	-0.070	0.482	-	-
Child gender (1 = Male, 2 = Female)	0.047	0.637	-	-
Parental age	0.046	0.648	-	-
Child age	-0.009	0.925	-	-
Total household income	0.006	0.954	-	-
Duration of ILI episode (in days)	-0.182	0.660	-	-

Factors put in the multiple regression model were in bold
^a Questionnaire for caregivers of children with ear–nose–throat infections or rhinopharyngitis
^b Defined as having one of the following: fever > 5 days, ILI symptoms >2 weeks, presence of otitis media or pneumonia, hospitalisation

found in this study and in a qualitative study based on the same sample [25].

Furthermore, although the impact of ILI on the child and family is generally short-lived, it is a common experience. In population terms, the density of impact is substantial and, as countries consider the cost-effectiveness of adding influenza to routine childhood vaccination schedules, it is important to consider the impact on quality of life of affected families to enable a holistic assessment of disease burden.

PAR-ENT-QoL was considered as a suitable instrument for measuring QoL in parents of children with ILI. PAR-ENT-QoL scores were more reflective of the mental components of the SF-12v2 Acute Form than of physical components. Caregivers of patients might still have a high level of physical functioning despite their QoL being impacted heavily in terms of social or emotional aspects. The Cronbach's alphas of the two domains were >0.8, indicating good internal consistencies and that the questionnaire items were reflective of their corresponding domains [37].

This study has some limitations. The SF-12v2 Acute Form has not been validated in caregivers of children affected by ILI or respiratory illness. No previous findings are available for comparison. However, a study found that results from the SF-36 Acute Form (one-week recall period) were more sensitive than the Standard Form (four-week recall period) to changes in health status in asthmatic patients [38]. The SF-12v2 Acute Form also has advantages over other popular validated questionnaires. The Nottingham Health Profile [39] was less sensitive to minor levels of discomfort when compared with SF-36 [40]; the

Sickness Impact Profile requires 20–30 min to complete and would have been inappropriate for telephone interviews [41]; the Health Utilities Index [42] assesses functional capacity rather than performance status, which was not appropriate for our setting; and EuroQoL (EQ-5D) [43] is only available for self-administration [40].

Similarly, the PAR-ENT-QoL questionnaire is a disease-specific questionnaire validated for caregivers of children with ear, nose or throat infection, and rhinopharyngitis but not for ILI, although these illnesses all affect the respiratory tract and are usually accompanied by fever. The validated version of PAR-ENT-QoL is in French. We used the English version translated by the authors for this study. This is also the first study using PAR-ENT-QoL to administer at two time points to measure the parental QoL change, rather than measuring the QoL during the illness episode only. However, the reproducibility could be further confirmed in future studies. Correlation between PAR-ENT-QoL and SF-12v2 Acute Form scores in our study indicated that the PAR-ENT-QoL has an acceptable level of validity and reliability when used in the ILI setting.

Results in our study may have been affected by recall bias since QoL was measured 2 weeks after the onset of illness and not at the end of the child's ILI. In this study, nearly half of the children had their ILI resolve within a week and parents were back to their normal lives when the survey was conducted. Due to the acute nature of ILI, parents should ideally be followed up every day or every other day to ensure QoL changes were monitored throughout the whole ILI period.

In Australia, 47 % of children aged 2–3 years attend formal childcare [45]. Therefore, childcare centres were the

best possible source for recruitment. Our findings are likely to be generalisable to parents of children residing in large cities or developed countries. Our study has a few implications. These QoL findings can complement the economic estimation of disease burden, particularly when mothers of young children may not be in the labour force or are only employed part-time [45]. In 2005, only 39 % of Australian women with children under the age of two entered the labour force, of which nearly half worked only 15 h per week [45]. Such employment patterns are similar in the USA [46] and the UK [47]. Also, QoL data collected from parents of children with laboratory-confirmed influenza could inform the government regarding prioritisation of funding for vaccination of particular community groups. Furthermore, parental QoL allows a more comprehensive estimate of disease burden to assist the prioritisation of vaccine development, such as the RSV vaccine that is currently under development [49].

In terms of reducing parental burden, it is possible to alleviate this burden by introducing more flexible workplace policies, such as improved acceptance of working from home, provision of flexible work hours, and provision of specific leave allowances to care for ill family members [49]. Currently, employees of the Australian government are entitled to carer's leave, but this has not yet been applied to the private and non-governmental sectors [50]. For clinicians managing children with ILI, we have shown that emotional and social disruption to the family are important aspects to take into consideration when deciding upon management.

Conclusion

Our study highlights a significant decrease in parental QoL when their otherwise healthy children had ILI, compared with both before illness and with parents of children without ILI. These QoL findings can complement the economic evaluation of ILI disease burden and are probably generalisable to other families residing in large cities or developed countries. Since the prevalence of ILI can be high in children during each influenza season, the public health impact of ILI in children on the QoL of families is far from negligible. Future studies should address this impact and focus on alleviating the burden on families during the child's illness.

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