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ORAL CANCER AWARENESS AND INDIVIDUALS' INCLINATION TO ITS SCREENING AND RISK PREDICTION IN HONG KONG

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Abstract:	Assessing the baseline knowledge status and expectations of the target population of any health promotion and secondary prevention program is essential to the success of such intervention. To obtain this information about the Hong Kong population a priori to implementing these preventive strategies for oral cancer in addition to determining the willingness of potential screening participants to take risk-profiling assessments, a cross-sectional survey was conducted between November 2019 and March 2020. A total of 964 residents between the ages 18 – 86 years were invited to participate in this study across the three geographical areas in Hong Kong. Most participants self-reported being aware of oral cancer (86.3%), although the proportion of those with substantial knowledge on salient risk factors and early identifiable signs were very low (2.9%). Age and level of education were the only demographic characteristics associated with the knowledge status. The proportion of participants willing to attend community screening and partake in risk profiling assessment was high (83.9% and 80.9% respectively). Willingness to attend community screening was directly associated with respondents' self-reported oral cancer awareness status (OR: 1.9, 95% CI: 1.22 – 2.96). Also, we observed that those participants who were willing to attend screening are more inclined to take risk prediction assessments that those not willing to attend. These findings have showcased the need to intensify health promotion via personal skills development to encourage early disease presentation and will assist in the planning of these programs accordingly in the Hong Kong population.
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ORAL CANCER AWARENESS AND INDIVIDUALS' INCLINATION TO ITS SCREENING AND RISK PREDICTION IN HONG KONG

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ABSTRACT

Assessing the baseline knowledge status and expectations of the target population of any health promotion and secondary prevention program is essential to the success of such intervention. To obtain this information about the Hong Kong population a priori to implementing these preventive strategies for oral cancer in addition to determining the willingness of potential screening participants to take risk-profiling assessments, a cross-sectional survey was conducted between November 2019 and March 2020. A total of 964 residents between the ages 18 – 86 years were invited to participate in this study across the three geographical areas in Hong Kong. Most participants self-reported being aware of oral cancer (86.3%), although the proportion of those with substantial knowledge on salient risk factors and early identifiable signs were very low (2.9%). Age and level of education were the only demographic characteristics associated with the knowledge status. The proportion of participants willing to attend community screening and partake in risk profiling assessment was high (83.9% and 80.9% respectively). Willingness to attend community screening was directly associated with respondents' self-reported oral cancer awareness status (OR: 1.9, 95% CI: 1.22 – 2.96). Also, we observed that those participants who were willing to attend screening are more inclined to take risk prediction assessments that those not willing to attend. These findings have showcased the need to intensify health promotion via personal skills development to encourage early disease presentation and will assist in the planning of these programs accordingly in the Hong Kong population.

Key words: cancer risk awareness, cancer screening, oral cancer, risk profiling

INTRODUCTION

Cancer is regarded as the leading cause of premature mortality worldwide, resulting in 18% of total deaths from any cause with over 18 million cases encountered annually.(1, 2) As early stages are asymptomatic or typified by vague signs and symptoms, the timing of patients' presentation is often fraught with grave clinical stages that bear fatal outcomes.(3) For malignancies with distinctive or visualisable early clinical signs, the triad of health promotion, disease prevention, and disease screening are all-important public health strategies to forestall potential increases in future incidence trends and improve net cancer survival.(1) Oral cancer, the second most-common malignancy of the upper aerodigestive tract (UADT), models these criteria excellently due to its long pre-pathologic phase, excellent access for direct examination, and higher treatment efficacy for those presenting early.(1, 4) Though paradoxically, the mean 5-year survival rate stands at 50% in most regions which infers the need for screening, education on relevant risk factors and self-detection of early lesions to encourage prompt patient presentation.(1) Nonetheless, before these strategies may be implemented, a baseline appraisal of the existing knowledge within the population is required. Widely disparate proportions of knowledgeable individuals on oral cancer, its risk factors, and self-perceived signs have been reported from descriptive surveys conducted in various countries with most indicating a low level.(5-11) However, the generalization of these observations are indeed limited to their target populations due to inherent demographic, socioeconomic, environmental, geographic and sociocultural differences that may affect public awareness.(10)

In Hong Kong Special Administrative Region (HKSAR), China, the annual incidence of oral cancer is approximately 3.4 per 100,000 persons with a mortality as high as 5.2 per 100,000 among individuals below 70 years.(12) Three studies have reported increasing oral cancer trends in the territory and mean survival time of 4.14years in the last decade which posits a hypothesis of frequent late clinical diagnosis.(13-15) With our ongoing efforts to establish oral cancer screening guidelines and programs as well as distinguish high-risk individuals, a baseline report on the current disease awareness level and evaluation of factors that may determine the population compliance in these programs is now required. Likewise, as our group aims to pilot a risk prediction algorithm based on lifestyle, viral and genetic predictors for better stratification of screen-negative at-risk individuals needing periodic monitoring, there are some speculations regarding its feasibility and acceptance among residents. Therefore, this composite study aims to preliminarily assess the level of oral cancer awareness and knowledge of proposed health promotion information (HPI) in Hong Kong vis-à-vis determining residents'

willingness to partake in screening programs and perform tests aimed at providing them with an estimated likelihood of oral cancer occurrence.

MATERIALS AND METHODS

This survey was granted ethical approval by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 19-710). A cross-sectional study design with descriptive and analytic purposes was conducted between November 2019 and March 2020.

Study Population and Sampling

Eligible participants for this study included all HK residents of Chinese descent aged 18 years and above who resided within the territory during the study period and were willing to participate in the study. Participants with previous oral cancer history or those who declined responses were excluded from the study. As this is the first attempt to investigate the survey objectives in the region, a generic sample proportion of oral cancer awareness levels were used to obtain a minimum sample size of 500 participants while considering a non-response rate of 30%. Although at the time of survey planning a multistage sampling method was envisaged, its impracticability in the territory within the study period favoured the use of non-probability sampling methods; establishing the preliminary nature of this report. Community-based strategy was applied for recruiting study participants using quota sampling technique according to the Hong Kong 2016 census population proportions for gender and area of residence for the age group considered.

Questionnaire Design

A self-administered questionnaire was designed from items employed in previous studies and from pertinent sections of the Cancer screening questionnaire.(7-10, 16-18) The questionnaire initially constructed in English language by an investigator (JA) comprised 32 items which were divided into three main sections – sociodemographic information, assessment of oral cancer awareness and knowledge of proposed health promotion information (HPI; risk factor and early identifiable signs), and willingness to partake in oral cancer screening and risk profiling assessments. Both open and closed-ended question formats were included as appropriate and language structure was set at the 6th-grade readability to enhance participants' understanding. To encourage compliance, the structured items were forward translated to Chinese by one member of the survey team (S-WC) and two independent individuals with different levels of language proficiency to ensure it was understandable to people of different

language readability in the target population. Backward translation to English to ensure relevance of the questions was carried out by two other persons uninvolved in the initial process. Face validity for the initial drafts was provided (S-WC, PT) while qualitative content validity was conducted via separate discussions held with oral medicine, community health, statistics content experts alongside lay experts. Quantitative content validity analysis for survey items based on experts' opinion was sufficient with chance-adjusted item-level content validity index (I-CVI) for clarity and relevance scores ranging from 0.69 to 1.00. Further, overall scale-level content validity ratio for the questionnaire using both the universal experts' agreement and I-CVI averaging methods were 0.71 and 0.96 respectively. The questionnaire was pretested among 23 respondents with minor adjustments effected to select items before administration proper. Respective internal consistency values assessed using Kudar-Richardson 20 for the knowledge assessment and screening willingness scales were 0.736 and 0.946. Timing of response was also approximated to mostly vary between three and five minutes.

For outcome evaluation, unidirectional questions assessing the level of knowledge of proposed HPI including details on the risk factors (11 items) and early signs of oral cancer (5 items), were assigned a dichotomous scale (Yes or No). A score of 0 and 1 was apportioned for each incorrect and correct response after which a total score was calculated. Study participants that selected the "I don't know" options for either item was assigned an overall score of 0. Also, total knowledge scores for risk factors and early signs were summed to obtain an overall knowledge of oral cancer HPI score with an achievable range of 0 - 16. As proposed previously, overall participant knowledge scores above the third quartile, within the third quartile and below the median of the achievable scores were graded as substantial, moderate and poor respectively.(10)

Questionnaire Administration

As the most recent publications of the Hong Kong Census and Statistics Department indicate that 81.4% and 99.1% of households have internet connections via personal computers and smartphones respectively, an online-based platform was utilised to achieve the sample quota from different geographic areas.(19) Invitations to participate in the survey and weblinks were spread by word-of-mouth, electronic broadcast messages, and social media advertisements for five months. Participants were provided the option to complete the questionnaire either in English or Chinese and were duly informed on the objectives and significance of the study, their rights of confidentiality, and instructions for completing the questionnaires. Emphases were made to submitting a single response and providing answers to the items based on their

current knowledge without help from external sources. Consent was sought electronically before addition to their participation in the study. On completion, survey respondents were offered a chance to enter a gift card ballot conducted after the study period as incentives for their participation. Given the employed sampling method, self-completed data collection used, the preliminary nature of the study, and potential response bias, twice the proposed minimum sample size was recruited into the study.

Statistical Analysis

Descriptive statistics for all explanatory variables were represented in tables or figures. Normal distribution of continuous variables was assessed using the Kolmogorov-Smirnov normality test. Mann-Whitney U and Kruskal-Wallis H tests were used to determine the difference in the median knowledge of oral cancer health promotion information items based on the sociodemographic characteristics of participants. For multiple comparisons, Mann Whitney's test was also used to ascertain peculiar differences between the groups while applying Bonferroni correction. Bivariate analyses for categorical variables were conducted using Pearson's Chi-Square test and Chi-square Exact tests. Multivariable analyses were done to assess the effect of independent variables on the HPI knowledge scores and willingness of participants to attend screening programs. All data analyses were performed using SPSS v 26 and R statistical software v 4.0.0 using the 'lavaan' package.(20) Probability values < 0.05 was accepted as statistical significance for all tests performed.

RESULTS

A total of 995 responses were received with 31 duplicates identified using the email addresses provided by the participants. For these responses, only the first entry was considered valid. Nine hundred and sixty-four participants were included for analysis comprising individuals between ages 18 and 86 years with an average (SD) of 39.42 (13.94) years (Table 1). More participants were within 18 and 39 years compared to other age groups (53.4%, n = 515), and 58.2% (n = 561) were females. Majority were educated at least to the tertiary level (65.0%, n = 534) and were either entrepreneurs or engaged in employment positions within the public and private sectors (45.3%, n = 436). Information provided on tobacco use and alcohol consumption showed that 6.4% (n=62) and 14.8% (n = 143) were current and ex-users of tobacco while 15.7% (n = 151) and 7.0% (n = 67) were current and ex-drinkers respectively (Table 1). Statistically significant difference was only observed in the distribution of participants recruited from the three geographical areas based on their monthly income with more proportion of individuals earning above 70,000 HKD living on Hong Kong Island and Kowloon than New Territories (Supplementary Table 1).

Self-reported Oral Cancer Awareness and HPI Knowledge levels

Majority of the study participants stated that they had heard about oral cancer previously (86.3%, n = 832); citing internet platforms (53.8%, n = 448), mass media outlets (48.6%, n=404) and print materials (44.2%, n = 368) as their primary sources of awareness. Those whose source of awareness was during medical or dental consultations were 23.7% (n=197). No significant differences were observed in the sociodemographic distribution of those who were aware and unaware of the disease condition (p=0.179 – 0.888). Further assessment of the knowledge levels on oral cancer risk factors and early signs among aware participants produced respective median (IQR) scores of 4.0 (2.0) and 2.0 (2.0). Of the individuals that provided correct responses to individual items (*See Appendix)*, most individuals were aware of tobacco use, betel nut chewing and alcohol consumption, and genetic predisposition as pertinent factors for oral cancer development. Also, non-healing ulcers (59.4%, n = 453) and persistent oral lumps (48.0%, n = 399) were the two most known early signs; although 23.7% of participants (n = 197) were not familiar with what constituted early signs of oral cancer. Looking at the distribution of participants based on their tobacco habits and knowledge of tobacco use as a risk factor revealed that a significantly higher proportion of current users (64.8%, n=35) did not acknowledge smokeless tobacco as a risk factor of oral cancer in comparison to non-users($p<0.001$). Although more participants with current and previous tobacco smokers and

alcohol consumers considered their habits as risk factors, no difference was observed in the proportional distribution in comparison to those without the habit. Nonetheless, 83.8% (n = 697) of participants indicated an interest in being provided additional salient information on the disease.

Non-parametric correlation revealed a significant weak positive correlation between the scores obtained on the knowledge of risk factors and knowledge of early signs items (ρ=0.385; $p < 0.001$). Comparison of the median scores on both key items based on the demographic characteristics of participants yielded significant differences only in the knowledge of risk factor scores according to their age group, level of education, and tobacco use status (Table 2). The median knowledge of risk factor scores was significantly higher in young than middle-aged participants ($p <0.001$), and in those who had tertiary and postgraduate education than secondary education ($p<0.001$, $p=0.002$). Also, current tobacco users were found to have significantly lower median oral cancer risk factor knowledge scores than non-users ($p = 0.013$). The median HPI knowledge score (IQR) obtained was 6.0 (4.0). Categorical transformation showed that 2.9% (n = 24), 19.5% (n = 162) and 77.6% (n = 646) had substantial, moderate and poor combined knowledge of oral cancer risk factors and early presentation. Bivariate comparisons revealed significant differences in the proportional distribution of knowledge categories based on participants' age group and education only. A significantly higher proportion of participants with substantial HPI knowledge were young adults in comparison to middle-aged and elderly participants while the proportion of participants with poor knowledge was highest in the middle-age group ($p=0.004$). Likewise, more individuals with substantial knowledge were educated at the tertiary level and above ($p=0.021$). Multivariable analysis further established the effect of age and education as predictors of HPI knowledge with a 0.027 score reduction for one unit increase in the age observed (Table 3). Table 3 also shows that when compared to those with no education, participants with tertiary and post-tertiary qualifications had better HPI knowledge with higher total scores by 3.23 and 3.35 respectively.

Self-reported Awareness and Willingness to partake in Oral cancer Screening and Risk prediction

The proportion of those aware of oral cancer screening and risk profiling methods was 61.4% (n = 592) and 20.7% (n = 200) respectively with only 10.5% (n = 62) of these individuals being screened previously. Significant differences in the distribution of aware and unaware participants were observed based on their gender, education, tobacco use and alcohol

consumption status (Table 4). A substantially higher proportion of current/ex-tobacco users reported awareness on oral cancer screening ($p<0.001$) as well as more individuals who currently consumed alcohol than non-drinkers ($p=0.015$).

The willingness-to-attend community oral cancer screening programs rate among the participants was 83.9% (n=809) which was slightly higher than the proportion of those inclined to taking prediction assessments (80.9%, n=780). No sociodemographic differences were observed between those who were willing to attend screening programs and take prediction tests; however, a significantly higher proportion of participants that were unaware of the disease prior to participation were unwilling to partake in the programs ($p=0.006$) (Table 4). Logistic regression confirmed the association between oral cancer awareness and willingness to attend screening events with a higher likelihood of attendance among those who were aware (OR: 1.9, 95% CI: 1.22 – 2.96) (Supplementary Table 2). Of the participants that returned responses on the reasons for declining attendance (n = 72), the majority perceived screening as 'unnecessary' due to their belief of having low risks of developing oral cancer or due to regular visits to their oral healthcare providers (43.1%, n = 31). Other prominent reasons cited included fear of the screening procedure and/or results (15.2%) and the unwillingness to apportion time to attend screening (11.1%). Also, a significant association between self-reported oral cancer screening awareness and willingness to participate in prediction exercises was noted with those who were aware being less likely to undertake the assessments (OR – 0.55, 95% CI: 0.33 – 0.93). Common reasons for refusal to partake in risk prediction exercises were similar to those provided for screening programs; although the proportion of those who cited 'fear of the procedure and/or results' (24.3%) and 'time factor' (15.7%) were higher comparatively. Structural equation modelling (SEM) analysis of exogenous variables with p-values ≤ 0.25 from bivariate analysis and all endogenous variables shows that the willingness to attend the community screening had the most important positive bearing on individuals' participation in risk prediction assessments (Figure 1).

DISCUSSION

Obtaining baseline knowledge information and appraising the readiness of the target population for disease prevention programs involving health promotion, risk-behaviour modification, and disease screening is paramount to the success and impact of such interventions. Such methodical approaches, which are infrequently applied to planning prevention programs for UADT malignancies may contribute to the stagnant overall disease mortality despite the programs in place in high-risk countries. As refinement to the norm, this survey sought to confirm the relevance of planned public health prevention approaches for oral cancer while increasing the likelihood of program proficiency in the HK population.

Principal findings relating to the relevance of health promotion among HK adults showed that the participants also mirrored the more-common observation of high self-reported oral cancer awareness level and poor knowledge of its HPI documented in previous studies in other countries.(7-10, 21, 22) While this finding is unsurprising as no advocacy or personal skills development program for oral cancer or other UADT malignancies have been previously implemented in the territory, the observation of low HPI knowledge bolsters our previous hypothesis of aggressive clinical disease and reduced overall survival rate in the region due to late-stage presentation.(13) Nonetheless, the classic triad of tobacco use, alcohol and betel nut consumption in addition to genetic predisposition were most acknowledged as aetiologic factors by majority of the participants which indicates the need for further enlightenment on other risk modifying factors especially HPV infection, prolonged sunlight exposure, inappropriate health-seeking behaviour and cannabis smoking.

Though with substantially low knowledge on the entirety of oral cancer risk, majority of participants in the subsample that chew/smoke tobacco and consume alcohol also knew about the disease-causing implications of their habits at a level not disparate from non-consumers. This finding is in keeping with recent reports in the Scottish, American, and Australian population that more tobacco smokers and frequent alcohol consumers are aware of the pertinence their risk habits bear to oral carcinogenesis.(7, 18, 21) This further solidifies the changing trend in the risk factor knowledge level of those who practise the habits especially in developed countries and underscores the need for inclusion of other risk behaviour modifying programs such as habit cessation intervention in these subgroups.(9, 22). Interestingly, a significant difference was observed with regards the lack of knowledge on the carcinogenic effects of smokeless tobacco among current tobacco users (64.8%) in comparison with non-users (34.2%) and infers the need for emphasis of its role in future advocacy programs among this subgroup. Though the overall knowledge of early oral cancer signs was generally low,

participants were more knowledgeable of non-healing oral ulcers and persistent oral lumps as being early identifiable signs than other clinical forms which is in line with report of previous studies (7-9, 22). This further posits that participants with white, red, or mixed white and red lesions are less likely to perceive it as aggressive and underscore the need to address this notion in future advocacy programs.

The sociodemographic factors of age and education were found to influence HPI knowledge levels. Increasing age was uniquely associated with declining knowledge levels in our sample. With the online platforms serving as the most common source of health information for participants, this observation could be attributed to the frequency of internet use and higher reliance on the internet for general health information among younger individuals in the territory (23). Conversely, a positive association was observed for HPI knowledge levels based on the educational status of respondents. Despite the high internet penetrance in the territory, those educated at least to the tertiary level still had better knowledge of risk factors and early signs of oral cancer than those with secondary education or lower which is in line with previous findings (9, 10).

In general, the proportion of participants that had heard about oral cancer screening was moderate and 24.7% lower than those aware of the malignancy. Awareness of screening in our participants was higher than previously reported in Portugal (24). Screening rate among participants was very generally low even among at-risk individuals as only 13.1% and 7.7% of current- and ex-tobacco and alcohol consumers respectively had undergone screening procedures. This tallies with a previous finding in Kuwait where 5.4% of smokers had undergone screening(25) and may be adduced to inadequate sensitization among oral health providers towards being more inclined to oral cancer screening of at-risk individuals or inappropriate health-seeking behaviour among these sample subgroups to warrant being screened in the first place. Alternatively, since the awareness of oral cancer screening was more prevalent among at-risk sociodemographic groups such as males, those with less education and current or previous tobacco and alcohol consumers, the screening rate may not be as low as reported as they may not have considered conventional oral examination by a trained health professional the crux of oral cancer screening (26).

To our knowledge, this is the first investigation of the inclination of residents to a UADT malignancy screening program, and in particular, risk prediction assessment. A high proportion of participants were willing to present at community centres for oral cancer screening (83.9%) and take risk profiling tests (80.9%) in the event of screen-negative results which allay concerns on test feasibility among participants. In comparison, these proportions rank better

than reported in an American study where between 23% - 71% of participants were willing to attend community cancer screening programs (27). Also, the willingness rate in our study was higher than reported for colorectal, cervical and breast cancer screening and risk profiling (28-31). While socio-demographic factors did not serve as good predictors for participation screening and risk prediction, our study found unique direct relationships between self-reported oral cancer awareness and willingness to attend oral cancer screening programs as well as between presentation for screening programs and undertaking risk-profiling assessments. Thus, confirming the notion that screening attendees are more likely to partake in the risk prediction exercises than those who did not attend.

Our study is not without limitations. Notable is selection bias due to the use of non-probability sampling for the selection of participants. As obtaining a random sample for representativeness analysis was not feasible in HK within the study period, the quota sampling technique according to geographic areas and sex distribution represented the 'next-appropriate' sampling method to investigating the outcome measures within the study timeframe. Despite our best efforts as well, we were not able to select a representative population according to the age group, and this may limit the external validity of our findings. Also, the electronic method utilised for dissemination may be biased towards younger individuals. Further prospective population research using random samples is therefore needed to confirm the findings of our study and further identify predictors for attendance at community oral cancer programs and undertaking risk profiling tests as their willingness may not translate to practice. Another limitation is the subjective manner in which oral cancer awareness and HPI knowledge are normally assessed and the propensity for individuals to simply select options randomly from the list of provided items (22). Nonetheless, these knowledge assessment scales are the most empirical ones available (5, 8-10, 16, 18, 22, 25, 26).

CONCLUSIONS

Overall, the self-reported oral cancer awareness level in Hong Kong is high, however, the knowledge of its risk factors and visualisable early signs are indeed very low, signifying the need for intensified community education on these details as part of disease prevention and promotion of early patient presentation. Furthermore, the high knowledge of tobacco and alcohol consumption as risk factors among consumers observed indicates a need for inclusion of risk behaviour modification programs for these subgroups. The willingness rate to attend community oral cancer screening programs and perform risk profiling assessments was also high among participants. Self-reported oral cancer awareness had the most effect on the

decision to attend screening programs while those who attended screening programs were more likely to partake in risk-profiling assessments.

DECLARATIONS

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of Interest

None

Ethical Approval

Approval to conduct the study was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 19-710).

Consent to participate

All participants provided consent prior to participation.

Consent for publication

Not applicable.

Availability of data and material

Not applicable.

Code availability

Not applicable.

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FIGURE LEGEND

Figure 1: SEM model of exogenous and endogenous variables in relation to the willingness to perform risk prediction assessments. (R^2 = 0.858[FUTPD], 0.041 [FUTSC], 0.075 [AOCS]; AFI= 0.974, AGFI = 0.923, CFI = 0.976, TLI = 0.993, RMSEA = 0.087, SRMR = 0.005; ALC – Alcohol consumption, AOC – oral cancer awareness, AOCS – awareness of oral cancer screening, AOCRP – awareness of cancer risk prediction, EDU – Education, FUTSC – Willingness to attend screening, FUTPD – Willingness to undertake cancer prediction assessments, TKS – Total HPI knowledge score, TOB – Tobacco use)

Table

Table 1: Sociodemographic characteristics of participants

		n(%)
Age group	18 – 39	515 (53.4)
	40 – 64	411 (42.6)
	>65	38 (3.9)
Gender	Female	561 (58.2)
	Male	403 (41.8)
Education	None	5 (0.5)
	Primary	22 (2.3)
	Secondary	310 (32.2)
	Tertiary	534 (55.4)
	Postgraduate	93 (9.6)
Occupation	Unemployed	167 (17.3)
	Artisans/Labour-related	49 (5.1)
	Employed (Self/Public/Private)	436 (45.3)
	Professionals	190 (19.7)
	Others[b]	121 (12.6)
Income (HKD)[c]	<10,000	263 (27.3)
	10,000 – 40,000	547 (56.7)
	40,001 – 70000	107(11.1)
	>70000	47 (4.9)
Tobacco Use[d]	Current smoker/chewer	62 (6.4)
	Ex-smoker/chewer	143 (14.8)
	Non-smoker/chewer	759 (78.7)
Alcohol consumption[e]	Current drinker	151 (15.7)
	Ex-drinker	67 (7.0)
	Non-drinker	746 (77.4)

[a] One missing entry for occupation due to an uninterpretable entry.
[b] Others – Students, Security personnel, musicians and clerics; [c]HKD – Hong Kong Dollars
[d] Current smokers/chewers refers to those who at the time of data collection use any form of tobacco-containing products at least one every month. Ex-smokers or chewers were those who used tobacco previously in any form daily, weekly or monthly while non-smokers were those who have never used tobacco before or do so less than once monthly at the time of data collection.
[e] Current drinkers referred to those who at the time of data collection consume alcohol at least once every week. Ex-drinkers were those who consumed alcohol previously in any form daily or weekly while non-drinkers were those who have never consumed alcohol before or do so occasionally at the time of data collection.

Table 2: Comparison of oral cancer risk factors, early signs, and overall HPI knowledge median scores by sociodemographic characteristics of participants.

		Knowledge of oral cancer risk factors			Knowledge of early oral cancer signs			Overall knowledge level			Total (%)	χ^2
		Median Scores	Q1, Q3[a]		Median Scores	Q1, Q3[a]		Substantial (%)	Moderate (%)	Poor (%)		
Age group	18 – 39 (1)	5.0	3.00, 6.00	18.919[b]	2.0	1.00, 3.00	4.143 [b]	17(3.8)	103(23.1)	325(73.0)	445(100.0)	15.413
	40 – 64 (2)	4.0	2.00, 5.00	***p=<0.001***	2.0	1.00, 3.00	p=0.126	7(2.0)	51(14.2)	300(83.8)	358(100.0)	p=***0.004***
	>65 (3)	4.0	2.00, 6.00	(1>2)[c]	1.0	0.00, 2.50		0 (0.0)	8(27.6)	21(72.4)	29(100.0)	
Gender	Female	4.0	2.00, 6.00	79140.50[c]	2.0	1.00, 3.00	83199.00[c]	12(2.5)	89(18.3)	386(75.4)	487(100.0)	1.978
	Male	4.0	3.00, 6.00	0.151	2.0	0.00, 3.00	p=0.808	12(3.5)	73(21.2)	260(79.3)	345(100.0)	p=0.372
Education	None (0)	1.5	0.25, 4.25	40.774 [b]	0.5	0.00, 1.75	6.444 [b]	0(0.0)	0(0.0)	4(100.0)	4(100.0)	17.873 [d]
	Primary (1)	4.0	2.00, 5.75	***p=<0.001***	1.0	0.00, 2.75	p=0.168	0(0.0)	3(18.8)	13(81.3)	16(100.0)	p=***0.015***
	Secondary (2)	3.0	2.00, 5.00	(4=3>2)[c]	2.0	1.00, 3.00		3(1.1)	36(13.4)	229(85.4)	268(100.0)	
	Tertiary (3)	5.0	3.00, 6.00		2.0	1.00, 3.00		19(4.1)	104(22.3)	344(73.7)	467(100.0)	
	Postgraduate (4)	4.0	3.00, 6.00		2.0	1.00, 3.00		2(2.6)	19(24.7)	56(72.7)	77(100.0)	
Tobacco Use	Current smoker/chewer (1)	3.0	2.00, 5.00	7.747 [b] ***p=0.021***	2.0	0.00, 3.00	1.369 [b] p=0.504	1(1.9)	9(16.7)	44(81.5)	54(100.0)	0.543 [d] p=0.970
	Ex-smoker/chewer (2)	4.0	2.75, 6.00	(1 < 3)[c]	2.0	0.00, 3.00		3(2.4)	23(18.3)	100(79.4)	126(100.0)	
	Non-smoker/chewer (3)	4.0	3.00, 6.00		2.0	1.00, 3.00		20(3.1)	130(19.9)	502(77.0)	652(100.0)	
Alcohol consumption	Current drinker	4.0	3.00. 6.00	2.044 [b]	2.0	0.00, 3.00	0.046 [b]	3(2.3)	25(19.4)	101(78.3)	129(100.0)	1.319 [d]
	Ex-drinker	4.0	3.00, 5.50	p=0.360	2.0	1.00, 3.00	p=0.977	1(1.8)	8(14.0)	48(84.2)	57(100.0)	p=0.861
	Non-drinker	4.0	3.00, 6.00		2.0	1.00, 3.00		20(3.1)	129(20.0)	497(76.9)	646(100.0)	

[a] Q1 – Median of the first quartile scores, Q3 – Median of the third quartile scores; [b] Kruskal-Wallis H test; [c] Mann-Whitney U test; [d] Chi-square exact tests were used for bivariate analysis.

Table 3: Multivariate linear regression analysis of the effect of demographic factors on the overall knowledge of oral cancer health promotion information

Variables	Parameters	*B* (95% CI)	p-value
Constant[a]		3.775 (0.414, 7.137)	0.028
Age (in years)		-0.027 (-0.044, -0.009)	***0.003***
Gender	Male	0.333 (-0.119, 0.785)	0.148
	Female	0[b]	
Residential area	Hong Kong Island	0.089 (-0.480, 0.658)	0.759
	Kowloon	0.175 (-0.332, 0.682)	0.498
	New Territories	0[b]	
Education Level	Postgraduate	3.346 (0.124, 6.568)	***0.042***
	Tertiary	3.230 (0.067, 6.394)	***0.045***
	Secondary	2.364 (-0.797, 5.526)	0.143
	Primary	2.719 (-0.802, 6.241)	0.130
	None	0[b]	
Tobacco use	Current smoker/chewer	-0.743 (-1.656, 0.171)	0.111
	Ex-smoker/chewer	-0.289 (-0.926, 0.348)	0.374
	Non-smoker/chewer	0[b]	
Alcohol consumption	Current drinker	-0.095 (-0.723, 0.534)	0.768
	Ex-drinker	-0.432 (-1.301, 0.436)	0.329
	Non-drinker	0[b]	

[a]R square – 0.055 (Adjusted R square – 0.041); [b]Reference category.

Table 4: Comparison of awareness and willingness to undergo oral cancer screening and risk predicting assessments by the demographic characteristics, disease awareness and HPI knowledge

		Awareness of oral cancer screening			Willingness to attend oral cancer screening programs			Willingness to undergo risk prediction assessment at programs			Total (%)
		Yes (%)	No (%)	$\chi^{2\,a}$	Yes (%)	No (%)	$\chi^{2\,a}$	Yes (%)	No (%)	$\chi^{2\,a}$	
Age group	18 – 39	311(60.4)	204(39.6)	4.543	431(83.7)	84(16.3)	0.044	419(81.4)	96(18.6)	1.258	515 (100.0)
	40 – 64	263(64.0)	148(36.0)	p=0.103	346(84.2)	65(15.8)	p=0.978	328(79.8)	83(20.2)	p=0.533	411 (100.0)
	>65	18(47.4)	20(52.6)		32(84.2)	6(15.8)		33(86.8)	5(13.2)		38 (100.0)
Gender	Female	327(41.7)	234(58.3)	5.519	472(84.1)	89(15.9)	0.046	461(82.2)	100(17.8)	1.383	561 (100.0)
	Male	265(65.8)	138(34.2)	p=***0.019***	337(83.6)	66(16.4)	p=0.831	319(79.2)	84(20.8)	p=0.240	403 (100.0)
Education	None	3(60.0)	2(40.0)	21.241[b]	3(60.0)	2(40.0)	3.493	2(40.0)	3(60.0)	5.741	5 (100.0)
	Primary	14(63.6)	8(36.4)	***p=<0.001***	18(81.8)	4(18.2)	p=0.479	18(81.8)	4(18.2)	p=0.219	22 (100.0)
	Secondary	222(71.6)	88(28.4)		265(85.5)	45(14.5)		250(80.6)	60(19.4)		310 (100.0)
	Tertiary	299(56.0)	235(44.0)		448(83.9)	86(16.1)		436(81.6)	98(18.4)		534 (100.0)
	Postgraduate	54(58.1)	39(41.9)		75(80.6)	18(19.4)		74(79.6)	19(20.4)		93 (100.0)
Tobacco Use	Current	50(80.6)	12(19.4)	46.419	50(80.6)	12(19.4)	2.508	44(71.0)	18(29.0)	4.631	62 (100.0)
	smoker/chewer			***p=<0.001***			p=0.285			p=0.099	
	Ex-smoker/chewer	118(82.5)	25(17.5)		126(88.1)	17(11.9)		114(79.7)	29(20.3)		143 (100.0)
	Non-smoker/chewer	424(55.9)	335(44.1)		633(83.4)	126(16.6)		622(81.9)	137(18.1)		759 (100.0)
Alcohol	Current drinker	107(70.9)	44(29.1)	8.442	134(88.7)	17(11.3)	3.311	128(84.8)	23(15.2)	2.509	151 (100.0)
consumption	Ex-drinker	35(52.2)	32(47.8)	***p=0.015***	57(85.1)	10(14.9)	p=0.191	51(76.1)	16(23.9)	p=0.285	67 (100.0)
	Non-drinker	450(60.3)	296(39.7)		618(82.8)	128(17.2)		601(80.6)	145(19.4)		746 (100.0)
Oral cancer	Unaware				100(75.8)	32(24.2)	7.554	102(77.3)	30(22.7)	1.312	132(100.0)
awareness	Aware				709(85.2)	123(14.8)	p=***0.006***	678(81.5)	154(18.5)	P=0.252	832(100.0)
Knowledge of	Substantial	13(54.2)	11(45.8)	1.869	22(91.7)	2(8.3)	1.467	22(91.7)	2(8.3)	1.808	24(100.0)
health	Moderate	95(58.6)	67(41.4)	p=0.393	141(87.0)	21(13.0)	p=0.480	133(82.1)	29(17.9)	p=0.405	162(100.0)
promotion	Poor	409(63.3)	237(36.7)		546(84.5)	100(15.5)		523(81.0)	123(19.0)		646(100.0)
information											
Oral cancer	Yes				489(82.6)	103(17.4)	1.980	461(77.9)	131(22.1)	9.188	592(100.0)
screening	No				320(86.0)	52(14.0)	p=0.159	319(85.8)	53(14.2)	***p=0.002***	372(100.0)
Awareness											

[a] Pearson Chi-square test; [b] Chi-square exact tests were used for bivariate analysis.

Figure

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