Original Article

Effects of two-year oral health information provision on changes in gingival crevicular fluid in male day—night shift workers

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Abstract Background/purpose: Although dental diseases are related to systemic diseases and daily habits and are known to affect the quality of life, little attention has been paid to the importance of oral hygiene in Japanese working-age adults. We, thus, aimed to assess changes in the periodontal condition of working-age adults after providing regular oral health information at their workplace for two years.

Materials and methods: Two years of oral health information were provided to workers at four printing companies. The effectiveness thereof was assessed using gingival crevicular fluid (GCF) test results—lactoferrin (Lf), alpha-1-antitrypsin (AT), and aspartate aminotransferase (AST). Questionnaires on health literacy (HL) and dental terminology were also administered to the workers during annual check-ups.

Results: The baseline survey participants included were 234 male workers, of which 104 workers followed the same work schedule/day—night shifts and completed the two-year follow-up survey were examined. Providing continuous oral health information with regular updates did not improve participants’ self-administered GCF tests (Lf: \( P = 0.272 \), AT: \( P = 0.723 \),...
Introduction

Japan has become a super-aged society, and the proportion of the older adult population continues to increase. It is important to preserve or improve the health of the working-age population, as they currently support the older population and will become part of the older community in the future. Thus, occupational health care must be provided for working-age adults to increase their health and awareness.

To ensure occupational health, Japan has mandated annual general health examinations, stress assessments, and the provision of specific health guidelines for workers. However, dental health examinations are not mandatory for all workers, except for those who are exposed to chemicals that are toxic to the teeth or supporting tissues, despite the known importance of oral health for systemic health and quality of life. Companies that are not legally obliged to provide dental examinations to their employees tend to not actively offer dental health examinations.

Additionally, the rate of private dental health examinations among people aged 20 years and older is only approximately 50%, despite the high prevalence of periodontal diseases among working-age adults and the increased morbidity rate with age. Since periodontal diseases initially progress with few subjective symptoms, early prevention and detection of the diseases are imperative. Furthermore, periodontal status is affected by not only daily habits and oral self-care, but also work routines and schedules such as irregular work shifts. Considering these facts and the finding that periodontal status is correlated with the frequency of oral—dental health examinations conducted at workplaces and corresponding interventions, an occupational periodontal care system should be highly encouraged. However, to date, an efficient implementation method has not been introduced in Japan.

While direct oral—dental health examinations by dental professionals are ideal, considering the costs and time constraints, knowledge sharing and an efficient self-test method for workers may potentially serve as a first-line measure to raise awareness about dental hygiene and improve their oral condition. Education and motivation may also play an important role in oral health and periodontal disease prevention. For self-care, knowledge sharing might be useful, as continuous updating of knowledge and improvement of skills pertaining to oral prophylaxis are essential for habitual actions. The Gingival crevicular fluid (GCF) test is a relatively low-cost occupational periodontal test, which was employed in this study. Through assessments of the lactoferrin (LF), alpha-1-antitrypsin (AT), and aspartate aminotransferase (AST) levels, the GCF test can easily identify gingival inflammation, bleeding, and periodontal destruction. Furthermore, health literacy (HL) might be an important index since behavior modification is crucial after information retrieval.

Therefore, in this study, we aimed to assess changes in periodontal conditions among workers with irregular work schedules at companies that did not offer dental health examinations and to consider possible ways to promote oral health in the workplace. We sought to achieve these aims by regularly providing general oral health knowledge and evaluating its effects on workers’ oral health status at a two-year follow-up.

Materials and methods

This study was approved by the Dental Research Ethics Review Committee of Tokyo Medical and Dental University (approval number: D2014-060).

A total of 277 workers in the health insurance association of Company A, with branches located in four prefectures of Japan, were initially included in this study. Company A provides printing services mainly for newspapers. As the company is in charge of printing morning editions of newspapers, most workers are day—night shift workers, who alternate between day and night shifts and have irregular shifts from evening until early morning.

Self-reported questionnaires were administered thrice in each office from 2014 to 2016. Company managers distributed consent forms, documents explaining the study details, and questionnaires to the workers. Returning the questionnaire was deemed consent to participate in the study and use their self-administered GCF results (Hoken Kagaku Nishinohon Co., Ltd., Kyoto, Japan). The questionnaire was anonymous, and each returned questionnaire was assigned an identification number to link the data with the corresponding GCF test results. The survey was conducted annually, according to the timing of their annual general health examinations (Fig. 1). The workers were provided with an information leaflet five times a year. The GCF test results were returned approximately two months after each questionnaire submission. For the GCF test, the previous year’s results were also included when it was returned to the workers.
Provision of oral health information (Fig. 1)

Five types of leaflets were developed and provided to the participants between the annual general health examinations. For the first year, leaflets regarding oral function were sent once every two months, via a paper-type flyer; these included a summary of four keywords on oral health (mastication, saliva, tongue, temporomandibular joint); mastication; caries and saliva; tongue; and the temporomandibular joint and summary of the five leaflets. In the second year, leaflets regarding periodontal disease were sent. The leaflets included the following information: periodontal terminology and cleaning the cervical areas; using interdental cleaning tools (interdental brush, dental floss, and a tuft brush); the adverse effects of smoking and self-assessment of oral symptoms; choosing an appropriate toothbrush, toothpaste, and lifestyle; and periodontal and systemic diseases.

Questionnaires

The questionnaires inquired about the following: (1) participants’ demographic characteristics, such as sex and age; (2) presence of any dental disease; (3) presence of any systemic disease; (4) perceived oral symptoms (such as gingival bleeding and swelling); (5) lifestyle factors (smoking and alcohol consumption); and (6) work shift. The following items were also included to evaluate participants’ dental knowledge, and awareness: (1) dental terminology, which was assessed using a four-point scale; (2) perceived systemic and oral health conditions (from unhealthy [0] to healthy [100]); (3) the perceived association between systemic and oral conditions (from irrelevant [0] to extremely relevant [100]). To assess HL, the Health Literacy Scale for Workers, developed by Ishikawa et al., was used. The items in this scale are rated on a five-point scale.

GCF test

The GCF test is used to assess periodontal status; Lf, AT, and AST levels are correlated with the degree of periodontal pocket depth and bone loss. Each kit costs 1500 JPY, and GCF samples are collected by touching the gingival sulcus using a sterilized brush provided in the kit. The test is designed for easy use by non-healthcare professionals; in this study, samples were collected by the respondents themselves, who were not identified. The samples were sent to Hoken Kagaku Nishinihon Co. Ltd. For analysis, based on the following indicators: Lf (gingival inflammation), AT (bleeding), and AST (periodontal destruction). Lf, the antimicrobial protein of neutrophils, and AT, a marker of vascular leakage into the crevice, were measured based on the absorbance level by a spectroscopic device (Multiscan MSUV, Ladsystems, Helsinki, Finland). These indicators were classified into the following categories: "normal" (<0.4 μg/ml), "some caution required (mid-caution)" (0.4–0.8 μg/ml), and "caution required (caution)" (≥0.8 μg/ml). AST, a cellular enzyme, was analyzed by employing enzymatic methods using an automatic analyzer (Auto analyzer AU-5242, Olympus, Tokyo, Japan) and was classified into the following categories: "normal" (<10 IU/l) and "mid-caution" (≥10 IU/l). All indicators were presented with their concentrations in the extracted liquid. Among the three indicators, the indicator with the most severe diagnosis was used as the overall GCF diagnosis for that individual, based on the manufacturer’s definition. We also defined the “gingivitis” group by excluding those who appeared "normal" in all GCF items and those who appeared "mid-caution" for AST in the first survey.

Statistical analyses

Among those who participated in all three surveys, data from day–night shift workers who completed all parts of
the study were analyzed for periodontal changes during the study period. IBM SPSS Statistics for Windows (version 26.0; IBM Corp., Armonk, NY, USA) was used for all statistical analyses. Cronbach’s alpha was used to assess the internal consistency of questionnaire items. The McNemar test or the Wilcoxon signed-rank test was used to analyze the differences between the groups participating in all three surveys. The Mann–Whitney U test was used to analyze the differences between the two independent groups. A multiple regression analysis was performed to evaluate the effects of oral health information provision, smoking, age, and HL. A $P$-value less than 0.05 was considered statistically significant, and the multiplicity was adjusted using the Bonferroni correction.

Results

In total, 239 individuals participated in the first survey. As this study targeted only male workers, data from five women were excluded. Of the remaining 234 workers, 104 participated in all three surveys, and their data were analyzed (Table 1). The Cronbach’s alphas for the first, second, and third questionnaires were 0.83, 0.77, and 0.80, respectively.

The effects of information provision using leaflets (Tables 2 and 3).

The mean age of participants at the first survey was 38.4 (SD 8.3) years (range, 22–55 years). The mean score of HL five items was 3.0. In the HL index used, 4.0 or more is considered high HL. In the first survey, 30.8% of participants were smokers. The rate of interdental brush and dental floss use was 27.9%. GCF test results showed improvement after two years of the survey. However, while 25 (24.0%) participants read the leaflet at least once every year, 79 (76.0%) did not read them. In addition, information provided through leaflets did not improve the participants’ GCF test results (Table 3, Lf: $P = 0.272$, AT: $P = 0.723$, and AST $P = 0.067$). Smoking, age, and HL did not influence the GCF results between the first and third surveys.

The “gingivitis” group consisted of 30 (28.8%) participants; eight (26.7%) participants read the leaflet at least once every year, while 22 (73.3%) did not read them. There was no significant difference between those who read the leaflet at least once every year (mean 0.31 μg/ml, median 0.19 μg/ml) and those who did not (mean 0.20 μg/ml, median 0.29 μg/ml; $P = 0.765$) for the first and third surveys of Lf. There was no significant difference between those who read the leaflet at least once every year (mean 0.25 μg/ml, median 0.27 μg/ml) and those who did not (mean 0.01 μg/ml, median 0.25 μg/ml; $P = 0.696$) for the first and third surveys of AT.

Discussion

Considering that lifestyle and working style influence periodontal status, we analyzed the effectiveness of repeated information provision on GCF results and its associated factors in 104 individuals who followed the same working style. Periodontal pocket measurement and bacterial detection are important to assess the periodontal condition and diagnosis. However, it was difficult to offer such examinations to the company that had never previously conducted dental examination for night shift employees. We therefore designed a study with the system that could be implemented in such circumstances. We adopted the preferred GCF test and leaflets.

In this sample, the GCF results were not influenced by the provision of oral health knowledge. GCF markers were selected to evaluate inflammation and periodontal status, as Lf is reported to be associated with clinical indices such as probing depth, whereas AT indicates capillary leakage and bleeding in inflammation.21–24 AST levels help determine the ongoing tissue destruction and identify areas of active disease.25,26 Periodontal health will not improve through oral hygiene instruction alone. Therefore, the effects of the leaflet need further examination in the “gingivitis” group. However, no significant differences were found between those who read the leaflet and those who did not, even in the “gingivitis” group. Due to the small sample size of this study, analysis with adjusting for confounding factors was difficult.

Meanwhile, education and motivation may also play an important role in maintaining periodontal health and preventing diseases.19 An environment that enabled regular self-oral health checks and provided dental information might have increased participants’ awareness,13 which could explain our findings; however, the information provision alone could not improve participants’ oral condition.

Although leaflets were used in this study, participants’ level of understanding of the provided information was not examined. Behavioral change through interventions using leaflets requires readable and understandable materials,34 as well as adequate HL to understand the content.35 HL is defined as “the degree to which individuals have the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions,”36 which requires more skills to synthesize and apply said information. Thus, it might be necessary to consider HL improvements along with information provision. Communication with medical professionals is essential to improve HL, which also applies to the dental field.37–39

Thus, implementation of regular oral–dental health examinations and direct communication with healthcare professionals at workplaces in Japan must be considered, despite the challenges, to ensure better oral hygiene among workers. A positive environment may raise awareness concerning oral health and periodontal diseases, which could be another possible strategy to improve workers’ oral health status. However, in this study, information provision alone did not improve participants’ oral condition. Therefore, continuous efforts to develop and implement effective interventions to improve workers’ oral hygiene are needed in the future.

This study has some limitations. First, the generalizability of the findings is limited, as this study focused on male workers in one industry alone. However, as the previous studies showed that periodontal disease risks were higher in night shift employees, we focused on them. Consequently, we found that there were mainly male employees and few female employees. Therefore, we were unable to include female participants in this study. Thus, further studies that include both male and female workers in other occupations are recommended. Second, we did not
| Variables                                                                 | 1st          | 2nd          | 3rd          |
|---------------------------------------------------------------------------|--------------|--------------|--------------|
| **GCF test**                                                              |              |              |              |
| Lactoferrin                                                               | 0.19 (0.10, 0.39) | 0.35 (0.19, 0.64) | 0.16 (0.08, 0.28) |
| Alpha-1-antitrypsin                                                       | 0.25 (0.14, 0.45) | 0.25 (0.13, 0.48) | 0.02 (0.09, 0.36) |
| Aspartate aminotransferase                                                | 3.00 (1.00, 7.00) | 4.00 (1.00, 8.00) | 2.00 (1.00, 4.00) |
| **Health literacy on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree)** |              |              |              |
| Collecting information from various sources                               | 4.0 (3.0, 4.0)  | 4.0 (3.0, 4.0)  | 4.0 (3.0, 4.0)  |
| Extracting relevant information                                           | 3.0 (2.0, 3.8)  | 3.0 (2.0, 3.8)  | 3.0 (2.0, 3.8)  |
| Understanding and communicating the information                          | 2.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  |
| Considering the credibility of the information                           | 3.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  |
| Making decisions based on the information                                 | 3.0 (2.0, 4.0)  | 3.0 (2.0, 4.0)  | 3.0 (2.0, 4.0)  |
| Average score of 5 items                                                  | 3.0 (2.6, 3.2)  | 3.2 (2.6, 3.6)  | 3.0 (2.8, 3.4)  |
| **Subjective systemic and oral health conditions**                       |              |              |              |
| Systemic health status                                                    | 60.0 (50.0, 78.8) | 70.0 (50.0, 80.0) | 70.0 (50.0, 80.0) |
| Oral health status                                                        | 50.0 (50.0, 70.0) | 50.0 (40.0, 70.0) | 50.0 (50.0, 70.0) |
| Relationship between oral health and systemic health                      | 60.0 (50.0, 80.0) | 70.0 (52.5, 80.0) | 70.0 (50.0, 80.0) |
| **Knowledge of dental terminology on a 4-point scale from 1 (do not know) to 4 (can explain)** |              |              |              |
| Gingivitis                                                                | 2.0 (2.0, 2.0)  | 2.0 (2.0, 2.0)  | 2.0 (2.0, 2.0)  |
| Periodontitis                                                             | 2.0 (2.0, 2.0)  | 2.0 (2.0, 2.0)  | 2.0 (2.0, 2.0)  |
| Dental plaque                                                             | 2.0 (2.0, 2.0)  | 3.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  |
| Dental calculus                                                           | 3.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  | 3.0 (2.0, 3.0)  |
| Fluoride                                                                  | 2.0 (2.0, 3.0)  | 2.0 (2.0, 3.0)  | 2.0 (2.0, 3.0)  |
| 8020 Campaign                                                             | 1.0 (1.0, 3.0)  | 1.0 (1.0, 3.0)  | 2.0 (1.0, 3.0)  |
| **Dental clinic/hospital usage**                                          | 7 (6.7%)      | 8 (7.7%)      | 6 (5.8%)      |
| **Medical clinic/hospital usage**                                         | 14 (13.5%)    | 19 (18.3%)    | 17 (16.3%)    |
| **Subjective oral symptoms (presence or absence)**                       |              |              |              |
| Gingival bleeding                                                         | 34 (32.7%)    | 30 (28.8%)    | 37 (35.6%)    |
| Gingival swelling                                                         | 17 (16.3%)    | 15 (14.4%)    | 19 (18.3%)    |
| Tooth mobility                                                            | 11 (10.6%)    | 10 (9.6%)     | 6 (5.8%)      |
| Difficulty in chewing hard foods                                          | 8 (7.7%)      | 6 (5.8%)      | 10 (9.6%)     |
| Thirst                                                                    | 38 (36.5%)    | 37 (35.6%)    | 39 (37.5%)    |
| Halitosis                                                                 | 48 (46.2%)    | 43 (41.3%)    | 50 (48.1%)    |
| Regular dental health examination taker                                   | 19 (18.3%)    | 26 (25.0%)    | 27 (26.0%)    |
| **Life style**                                                            |              |              |              |
| Smoking                                                                   | 32 (30.8%)    | 28 (26.9%)    | 28 (26.9%)    |
| Exercise                                                                  | 43 (41.3%)    | 48 (46.2%)    | 53 (51.0%)    |
| Alcohol consumption                                                       | 60 (57.7%)    | 57 (54.8%)    | 56 (53.8%)    |
| Use of interdental brush and dental floss                                 | 29 (27.9%)    | 29 (27.9%)    | 36 (34.6%)    |
| **Overall GCF diagnosis**                                                 |              |              |              |
| Normal                                                                    | 60 (57.7%)    | 47 (45.2%)    | 71 (68.3%)    |
| Some caution required                                                     | 30 (28.8%)    | 33 (31.7%)    | 28 (26.9%)    |
| Caution required                                                          | 14 (13.5%)    | 24 (23.1%)    | 5 (4.8%)      |
| **Change in GCF diagnosis from the 1st survey**                           |              |              |              |
| Improved                                                                  | 24 (23.1%)    | 31 (29.8%)    |
| No change                                                                 | 37 (35.6%)    | 56 (53.8%)    |
| Worsened                                                                  | 43 (41.3%)    | 17 (16.3%)    |

*a* GCF, gingival crevicular fluid; *b* IQR, interquartile range.
Table 2  Comparison of the first, second, and third survey results of the 104 participants.

| Variables | Day-night shift workers (n = 104) | Difference |
|-----------|----------------------------------|------------|
|           | Wilcoxon signed rank test with Bonferroni correction | 1st-2nd 2nd-3rd 1st-3rd | 1st-2nd 2nd-3rd 1st-3rd |
|           | P-value | Median (IQR: 25%, 75%) |  |
| GCF test  |                                    |             |            |
| Lactoferrin | <0.001 \(^1\) | <0.001 \(^1\) | 0.077 | -0.1 (-0.4, 0.0) | 0.2 (0.0, 0.5) | 0.0 (-0.1, 0.2) |
| Alpha-1-antitrypsin | 0.675 | <0.001 \(^1\) | 0.010 \(^1\) | 0.0 (-0.2, 0.2) | 0.1 (0.0, 0.3) | 0.0 (-0.1, 0.2) |
| Aspartate aminotransferase | 0.399 | <0.001 \(^1\) | <0.001 \(^1\) | 0.0 (-4.8, 2.8) | 1.0 (-1.0, 5.8) | 1.0 (-1.0, 4.0) |

Health literacy on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

| Extracting relevant information | 0.033 | 0.662 | 0.087 | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) |
| Understanding and communicating the information | 0.002 \(^1\) | 0.496 | 0.037 | 0.0 (-1.0, 0.0) | 0.0 (0.0, 1.0) | 0.0 (-1.0, 0.0) |
| Considering the credibility of the information | - | - | - | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) |
| Making decisions based on the information | - | - | - | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) |

Average score of 5 items | 0.001 \(^1\) | 0.466 | 0.005 \(^1\) | -0.2 (-0.6, 0.2) | 0.0 (-0.4, 0.4) | -2.0 (-4.0, 0.2) |

Subjective systemic and oral health conditions

| Systemic health status | 0.024 | 0.949 | 0.005 \(^1\) | -2.5 (-18.8, 10.0) | 0.0 (-10.0, 10.0) | -5.0 (-13.8, 5.0) |
| Oral health status | - | - | - | 0.0 (-10.0, 10.0) | 0.0 (-10.0, 10.0) | 0.0 (-10.0, 13.8) |
| Relationship between oral health and systemic health | 0.001 \(^1\) | 0.975 | 0.001 \(^1\) | 0.0 (-20.0, 0.0) | 0.0 (-10.0, 10.0) | -2.5 (-20.0, 0.0) |

Knowledge of dental terminology on a 4-point scale from 1 (do not know) to 4 (can explain).

| Gingivitis | 0.002 \(^1\) | 0.047 | <0.001 \(^1\) | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) |
| Periodontitis | 0.012 \(^1\) | 0.028 | <0.001 \(^1\) | 0.0 (-1.0, 0.0) | 0.0 (-1.0, 0.0) | 0.0 (-1.0, 0.0) |
| Dental plaque | 0.058 | 0.028 | <0.001 \(^1\) | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) |
| Dental calculus | - | - | - | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) |
| Fluoride | - | - | - | 0.0 (-0.8, 0.0) | 0.0 (0.0, 0.0) | 0.0 (-0.8, 0.0) |
| 8020 Campaign | 0.180 | 0.001 \(^1\) | 0.051 | 0.0 (0.0, 0.0) | 0.0 (-1.0, 0.0) | 0.0 (0.0, 0.0) |

McNemar test

| 1st-2nd 2nd-3rd 1st-3rd | P-value |
|------------------------|---------|
| Subjective oral symptoms (presence or absence) |
| Gingival bleeding | 0.454 | 0.167 | 0.607 |
| Gingival swelling | 0.774 | 0.454 | 0.832 |
| Tooth mobility | >0.99 | 0.289 | 0.125 |
| Difficulty in chewing hard foods | 0.688 | 0.219 | 0.727 |
| Thirst | >0.99 | 0.824 | >0.99 |
| Halitosis | 0.332 | 0.210 | 0.839 |
| Regular dental health examination taker | 0.092 | >0.99 | 0.096 |
| Life style |
| smoking | 0.125 | >0.99 | 0.289 |
| Exercise | 0.383 | 0.359 | 0.041 |
| Alcohol consumption | 0.581 | >0.99 | 0.344 |
| Use of interdental brush and dental floss | >0.99 | 0.065 | 0.143 |
| Overall GCF diagnosis |
| Normal | 0.092 | <0.001 \(^1\) | 0.099 |
| Some caution required | 0.775 | 0.551 | 0.878 |
| Caution required | 0.121 | <0.001 \(^1\) | 0.049 |

\(^1\) Wilcoxon signed rank test with Bonferroni correction: \(^1\), \(P < 0.0167\); \(^2\) GCF, gingival crevicular fluid.

\(^1\) McNemar test with Bonferroni correction: \(^1\), \(P < 0.0167\).
use a control group to clarify the effects of information provision on workers’ oral health status. It was exceedingly difficult to have a control group in Japanese companies. Implementing some measures for occupational oral health promotion was urgent, thus we investigated possible methods that could be utilized. Therefore, we adapted this design in collaboration with the company. Third, the oral—dental health examination in this study was self-administered and a direct periodontal examination is recommended for a more accurate diagnosis and objective assessment of changes in the oral health status.

Despite these limitations, our findings suggest that dental health examinations must be implemented at workplaces in Japan to improve workers’ oral hygiene, notwithstanding the many challenges it may entail. However, as oral health information provision alone may not be an efficient strategy, a combination of various strategies must be considered to promote workers’ oral health.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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| Table 3 | Results of the multiple regression analysis. |
|--------|-----------------------------------------------|
| B | P | VIF | B | SE |
| Constant | 0.049 | 0.314 | 0.154 | 0.129 |
| 1st result of LF | 0.098 | 0.371 | 0.864 | 0.192 |
| 1st result of AT | 0.203 | 0.154 | 0.129 | 0.192 |
| 1st result of AST | 0.006 | 0.006 | 0.006 | 0.006 |
| Significance of F (P-value) | 0.001 | 0.001 | 0.001 | 0.001 |
| Adjusted R square | 0.23 |

Significance of F (P-value): a LF, Lactoferrin; b AT, alpha-1-antitrypsin; c AST, aspartate aminotransferase; d HL, Health Literacy; e B, coefficient; f SE, coefficient standard error; g β, standardized coefficient; h VIF, variance inflation factor.
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