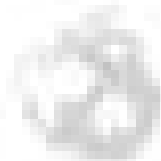

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Peripherally inserted central venous catheter-associated complications exert negative effects on body weight gain in neonatal intensive care units

JIE WEN, QUN YU, HAIYAN CHEN, NIANNIAN CHEN, SHOURONG HUANG AND WEI CAI

Background and Objectives: The placement of a peripherally inserted central venous catheter (PICC) is an essential procedure in neonatal intensive care units (NICU). The aim of this study was to determine the risk of PICC complications in NICU, and further identify the effects of PICC complications on body weight gain in premature infants. **Methods and Study Design:** A total of 304 premature infants who had a PICC inserted in NICU were enrolled in this study. The weight-for-age z-score (WAZ) at the time of PICC insertion and removal were calculated, and changes of WAZ in different groups were compared using a t-test. Risk factors for PICC complications were assessed using the chi-squared test and multiple logistic regression analysis. **Results:** Thirty (9.97%) PICCs were removed due to complications. Of them, 14 PICCs were removed because of non-infectious complications and 16 PICCs were removed for central-line-associated bloodstream infections (CLABSIs). Multiple logistic regression analysis showed that premature infants with birth weight >1,500 g were less likely to have PICC complications than infants with birth weight ≤1,500 g (OR, 0.29; 95% CI: 0.10-0.82; p=0.020). In addition, the changes in WAZ between PICC insertion and removal were significantly different in both infectious (-0.144±0.122, p<0.005) and non-infectious (-0.65±0.528, p<0.001) complications groups, compared with the no complications group (0.291±0.552). **Conclusions:** Findings from this study suggest that birth weight is a risk factor for PICC-associated complications in the NICU, and both infectious and non-infectious PICC complications are associated with poor body weight gain in premature infants.

Key Words: PICC complications, infectious complications, non-infectious complications, body weight, birth weight



The geriatric nutritional risk index may predict healthcare costs and health transitions during hemodialysis in China

YANNA DOU, PEI WANG, FANGFANG YUAN, XIANHUI LIANG, DONG LIU, JING XIAO, ZHANZHENG ZHAO AND ZHANGSUO LIU

Background and Objectives: The aim of the present study was to retrospectively analyze the relationship between the Geriatric Nutritional Risk Index (GNRI) at baseline and healthcare costs of three-month as well as the risk of quality-of-life score at the 6-month follow-up for Chinese hemodialysis patients. **Methods and Study Design:** One hundred patients who had been on maintenance hemodialysis were enrolled in this study. The general characteristics, laboratory test results and GNRI of the patients at baseline were recorded. The healthcare costs and quality-of-life scores were determined at the follow-up examination. **Results:** Patients were divided into two groups according to their median GNRI at baseline: a lower GNRI group (GNRI <86.4) and a higher GNRI group (GNRI >86.4). The patients in the lower GNRI group exhibited reduced hemoglobin (74.7±13.1 g/dL vs 82.3±15.2 g/dL, p<0.05) and albumin (27.4±3.3 g/L vs 34.5±4.0 g/L, p<0.05) as well as reduced body weight (62.7±9.5 kg vs 68.0±9.2 kg, p<0.05) at baseline. The medication cost at follow-up was higher in the lower GNRI group (RMB 3,238±1,534 vs RMB 2,378±1,048, p<0.05). And a lower GNRI at baseline was associated with increased future medication costs and worse health in hemodialysis patients. **Conclusions:** The present study suggests that a lower GNRI in hemodialysis patients may be associated with an increased risk of higher future healthcare costs as well as worse health.

Key Words: GNRI, nutrition, healthcare costs, quality-of-life score, hemodialysis



Initial energy supplementation in critically ill patients receiving enteral

nutrition: a systematic review and meta-analysis of randomized controlled trials

FENG TIAN, XUEJIN GAO, CHAO WU, LI ZHANG, XIANFENG XIA AND XINYING WANG

Background and Objectives: Here we systematically reviewed and quantitatively analyzed randomized controlled trials (RCTs) to compare the important initial outcomes of critically ill adults receiving low- and high-energy enteral nutrition. **Methods and Study Design:** RCTs comparing low- and high-energy supplementation in critically ill adults receiving enteral nutrition admitted to the intensive care unit for an expected stay of >48 h were included. Abstracts submitted to major scientific meetings were included and the primary endpoint was mortality. The risk ratio (RR) and weighted mean difference (WMD) with 95% confidence intervals (CIs) were the effect measures. **Results:** Eleven RCTs (3,212 patients) were included. The groups did not differ significantly in mortality (RR, 0.94; 95% CI, 0.80-1.11; $p=0.47$), infections morbidity (RR 1.09; 95% CI 0.95-1.26; $p=0.23$), pneumonia morbidity (RR 1.04; 95% CI 0.88-1.23; $p=0.68$), hospital length of stay (WMD -0.27; 95% CI -3.21 to 3.76; $p=0.88$), intensive care unit length of stay (WMD -0.32; 95% CI, -1.81 to 1.16; $p=0.46$), mechanical ventilation days (WMD -0.30; 95% CI -1.42 to 0.82; $p=0.60$). The incidence of gastrointestinal intolerance was significantly lower in the low-energy group (RR 0.79; 95% CI 0.65-0.97; $p<0.05$). **Conclusions:** The initial administration of low- versus high-energy supplements did not impact clinical outcomes except for gastrointestinal intolerance in non-malnourished critically ill patients receiving enteral nutrition. The initial administration of high rather than low-energy may benefit these patients by reducing infections, but this effect might actually be attributable to the concomitant high protein intake.

Key Words: critical illness, enteral nutrition, meta-analysis, energy intake, protein intake



Nasoenteric tube versus jejunostomy for enteral nutrition feeding following major upper gastrointestinal operations: a meta-analysis

LIDONG WANG, ZHONG TIAN AND YUAN LIU

Background and Objectives: Following major upper gastrointestinal surgical procedures, early enteral nutrition to the jejunum is strongly recommended, either through a nasoenteric tube or a percutaneous transperitoneal jejunal feeding tube (jejunostomy). However, to date there has been no consensus as to the best enteral feeding strategy. Our aim was to determine the safest and most efficacious early enteral nutrition supplement strategy following major upper gastrointestinal operations. **Methods and Study Design:** PubMed, Embase and Cochrane Library databases were systematically searched for comparison of trials. The primary outcome analyzed was length of postoperative hospital stay, and secondary outcomes were: duration of enteral nutrition, time to resumption of normal oral intake, and tube dislodgement, tube leakage and tube obstruction complications. Weighted mean differences (WMDs) and risk ratios (RRs) were calculated with 95% confidence intervals (CI). **Results:** A total of 5 studies were included with 420 patients in all. The length of hospital stay, duration of enteral nutrition and the time to resumption of normal oral intake were all significantly shorter in the nasoenteric group ($p<0.05$). There was no increase or reduction in the RR of tube obstruction between the nasoenteric and jejunostomy groups ($p=0.5$). The RR of tube dislodgement was increased in the nasoenteric group ($p<0.05$) while the RR of tube leakage was increased in the jejunostomy group ($p<0.05$). **Conclusions:** A nasoenteric tube is more likely to be effective in early postoperative enteral feeding following major upper gastrointestinal operations.

Key Words: nasoenteric tube, jejunostomy, enteral nutrition, upper gastrointestinal operations, meta-analysis



The impact of implementation of an enteral feeding protocol on the improvement of enteral nutrition in critically ill adults

SEOUNG-HYUN KIM, CHI-MIN PARK, JEONG-MEEN SEO, MINGEW CHOI, DAE-SANG LEE, DONG KYUNG CHANG, MIYONG RHA, SOYOUNG YU, SEONHYE LEE, EUNMEE KIM AND YOUNGYUN

Background and Objectives: The optimal delivery of enteral nutrition (EN) may improve clinical outcomes in critically ill patients; thus, optimal EN protocols should be developed. The purpose of this study was to evaluate the impact of implementing an EN protocol on the improvement of EN practices and on the clinical outcomes of critically ill patients. **Methods and Study Design:** This was a retrospective study with prospectively collected data. Multidisciplinary working group developed an evidence-based EN protocol based on an extensive review of literature and existing guidelines. Subjects included patients consecutively admitted to the ICU who received EN for more than 24 hours. EN practices and clinical outcomes were compared before and after implementation of the protocol. **Results:** A total of 270 patients were included, 134 patients before implementation and 136 after implementation of the protocol. EN was initiated earlier (35.8 vs 87.1 hours, $p=0.001$) and more patients received EN within 24 hours (59.6% vs 41.0%, $p=0.002$) after implementation of the protocol. The interval between starting EN and reaching the caloric goal was not different, but more patients reached the caloric goal after implementation (52.2% vs 38.3%, $p=0.037$). The post-implementation group was given more prokinetics and less parenteral nutrition. The incidences of diarrhea and gastrointestinal bleeding significantly decreased following implementation of the protocol. There was no difference in clinical outcomes including in-hospital mortality and length of hospital and ICU stay. **Conclusion:** The implementation of the EN protocol significantly improved the practices of EN and decreased complications in critically ill patients. Clinical outcomes were not different before and after implementation.

Key Words: intensive care units, critical illness, nutrition therapy, enteral nutrition, clinical protocols



Relationship of aging and nutritional status to innate immunity in tube-fed bedridden patients

YOSHIKI TAKEUCHI, TOMOE TASHIRO, TAKUYA YAMAMURA, SEIICHIRO TAKAHASHI, KOZO KATAYOSE, SHIN KOHGA, MITSUNORI TAKASE AND MICHIO IMAWARI

Background and Objectives: Aging and malnutrition are known to influence immune functions. The aim of this study was to investigate the relationship of aging and malnutrition to innate immune functions in tube-fed bedridden patients. **Methods and Study Design:** A cross-sectional survey was performed in 71 tube-fed bedridden patients aged 50-95 years (mean age \pm SD, 80.2 \pm 8.5 years) with serum albumin concentrations between 2.5 and 3.5 g/dL. We evaluated associations of age and nutritional variables with natural-killer cell activity, neutrophilphagocytic activity, and neutrophil-sterilizing activity. Nutritional variables included body mass index, weightadjusted energy intake, total lymphocyte count, and serum concentrations of albumin, transferrin, prealbumin, total cholesterol, C-reactive protein, and zinc. **Results:** Natural-killer cell activity, neutrophil-phagocytic activity, and neutrophil-sterilizing activity were normal or increased in 67 (94%), 63 (89%), and 69 (97%) patients, respectively. Multiple linear regression analysis with a backward elimination method showed that natural-killer cell activity correlated negatively with aging and lymphocyte counts ($p<0.01$ for both) but positively with body mass index and transferrin ($p<0.01$ for both). Neutrophil-phagocytic and neutrophil-sterilizing activities were not associated with any variables. **Conclusions:** In tube-fed bedridden patients with hypoalbuminemia, natural-killer cell activity may be associated with aging, body mass index, transferrin, and lymphocyte counts.

Key Words: aging, natural-killer cell activity, neutrophil function, nutritional status, tube

feeding



A prospective study of nutritional supplementation for preventing oral mucositis in cancer patients receiving chemotherapy

TAKUYA OKADA, YASUAKI NAKAJIMA, TETSURO NISHIKAGE, TAIRO RYOTOKUJI, YUTAKA MIYAWAKI, AKIHIRO HOSHINO, YUTAKA TOKAIRIN, KENRO KAWADA, KAGAMI NAGAI AND TATSUYUKI KAWANO

Background and Objectives: Patients undergoing chemotherapy often develop distressing adverse effects such as oral mucositis and diarrhea. Nutritional support with elemental diet is effective against various gastrointestinal complications and may exert protective effects against adverse effects induced by chemotherapy. To evaluate the influence of elemental diet on chemotherapy-induced oral mucositis and diarrhea, we conducted a randomized control trial in patients with esophageal cancer undergoing chemotherapy. Methods and Study Design: Twenty esophageal cancer patients receiving chemotherapy with 5-fluorouracil plus cisplatin were assigned randomly to one of the following two groups: (1) receiving elemental diet with Elental (one pack per day) for 14 days and (2) not receiving Elental during chemotherapy. The severity of oral mucositis and diarrhea was graded using clinical examination by doctors and a standard questionnaire on days 1-14. Results: Based on the analysis of the standard questionnaire, the distribution of the maximum severity of oral mucositis showed a statistically significant reduction in the Elental group ($p=0.020$), while clinical examination showed insignificant reduction but shift toward lower grade. In the Elental group, the incidence of oral mucositis (grade 2) reduced consistently and the median grade was lower at all-time points. Regarding diarrhea, no difference was observed between the two groups based on the analysis of the standard questionnaire and clinical examination results. Conclusions: This study illustrates the effectiveness of oral elemental diet in preventing oral mucositis during chemotherapy. This is a preliminary report and further study with larger patients groups should be devoted to optimization of efficacy.

Key Words: chemotherapy, oral mucositis, diarrhea, elemental diet, esophageal cancer



Nutrition assessment and its relationship with performance and Glasgow prognostic scores in Vietnamese patients with esophageal cancer

TRAN CHAU QUYEN, JONGJIT ANGKATAVANICH, TRAN VAN THUAN, VO VAN XUAN, LE DANH TUYEN AND DO ANH TU

Background and Objectives: To determine the nutritional status of patients with esophageal cancer, and to investigate its relationship with performance status and prognosis. Methods and Study Design: This clinical, cross-sectional study was conducted from August 2014 to February 2015 at National Cancer Hospital, Hanoi, Vietnam. Stage III/IV esophageal cancer patients were assessed for their nutritional status (patient-generated subjective global assessment (PG-SGA) and SGA scores, BMI, mid-arm circumference (MAC), energy and protein intakes, weight changes, Karnofsky and Eastern cooperative oncology group performance scores (KPS/ECOG), and Glasgow prognostic score (GPS). Results: Sixty-four male patients were enrolled. The mean \pm standard deviation of PG-SGA score was 9.88 ± 4.41 . SGA revealed 44% as class B and 6.2% as class C. The BMI revealed 43.8% of patients were underweight. MAC measurement revealed 29.7% of undernourished patients. Patients with an energy intake <25 kcal/kg/d comprised 54.7%, and 48.4% with <1 g/kg/day of protein. Totally, 68.8%, 84.4% and 92.2% patients exhibited weight loss past 2-weeks, one-month and six-months, respectively. The PG-SGA and SGA strongly correlated with the KPS ($r=-0.717$ and 0.632 , both $p<0.001$) and ECOG ($r=0.672$ and 0.626 , both $p<0.001$), but were weakly correlated with the GPS ($r=0.332$ and 0.278 , $p<0.01$ and 0.05). The KPS, ECOG, BMI, MAC, energy and protein intakes, and weight change were not correlated with the GPS. Conclusions: Malnutrition, weight change, and insufficient intake were noteworthy in esophageal cancer patients. The PG-SGA and SGA were strongly correlated with

the performance status, but weakly correlated with prognostic indices.

Key Words: esophageal cancer, nutritional status, performance score, prognostic score, weight loss



Black tea consumption improves postprandial glycemic control in normal and pre-diabetic subjects: a randomized, double-blind, placebo-controlled crossover study

ARISA BUTACNUM, REWADEE CHONGSUWAT AND AKKARACH BUMRUNGPET

Background and Objectives: Postprandial glycemic control is important for prevention of diabetes. Black tea consumption may improve postprandial glycemic control. The major bioactive compounds are polyphenols, black tea polymerized polyphenol (BTPP). This study examined the effect of black tea consumption on postprandial blood glucose and insulin response following sucrose loading in normal and pre-diabetes subjects. Methods and Study Design: This study was a randomized, double-blind, placebo-controlled crossover study. Twenty-four subjects, male and female aged 20-60 years, normal and pre-diabetic, randomly ingested a sucrose solution with a low dose (110 mg BTPP), a high dose (220 mg BTPP) of black tea drink or a placebo drink (0 mg BTPP). Blood samples were collected at 0, 30, 60, 90, and 120 min from commencement of drink ingestion to measure blood glucose and insulin levels. Results: The drink containing low dose and high dose BTPP significantly decreased incremental blood glucose area under the curve (AUC) after sucrose intake compared with placebo in the normal (T0-60 min 3,232±356 vs 3,295±312 vs 3,652±454 mg.min/dL; p=0.016) and pre-diabetic subjects (T0-60 min 2,554±395 vs 2,472±280 vs 2,888±502 mg.min/dL; p=0.048). There was no statistically significant difference of changes in insulin levels between the placebo and black tea groups (p>0.05). No significant differences in adverse effects were observed with the placebo, low dose and high dose of BTPP groups.

Conclusion: Black tea consumption can decrease postprandial blood glucose after sucrose intake.

Key Words: glycemic control, diabetes, black tea, black tea polymerized polyphenols, catechins



The effects of tomato juice on male infertility

YU YAMAMOTO, KOICHI AIZAWA, MAKIKO MIENO, MIKA KARAMATSU, YASUKO HIRANO, KUNIKO FURUI, TATSUYA MIYASHITA, KAZUMITSU YAMAZAKI, TAKAHIRO INAKUMA, IKUO SATO, HIROYUKI SUGANUMA AND TERUAKI IWAMOTO

Background and Objectives: This study aimed to investigate the effects of tomato juice consumption on seminal plasma lycopene levels and sperm parameters in infertile men. Methods and Study Design: Subjects were male infertility patients with poor sperm concentration (<20×10⁶/mL) and/or motility (<50%). Following a fourweek observation period, subjects were randomly assigned among three groups: a tomato juice group, an antioxidant group, and a control group. The subjects in the tomato juice group and the antioxidant group daily consumed one can of tomato juice (containing 30 mg of lycopene) or one antioxidant capsule (containing vitamin C 600 mg, vitamin E 200 mg, and glutathione 300 mg), respectively, for 12 weeks (feeding period). Seminal plasma lycopene levels and sperm parameters were measured every 6 weeks during the feeding period. Results: Forty-four patients completed the study (control group: 12, antioxidant group: 15, tomato juice group: 17). In the tomato juice group, plasma lycopene level was significantly increased at the 12th week of the feeding period. Moreover, a decrease in seminal plasma white blood cells and an increase in sperm motility in the tomato juice group were statistically significant at the 12th and 6th weeks, respectively, compared to the control group. In the antioxidant capsule group, no significant improvement was

observed in semen parameters. Conclusions: In conclusion, regular consumption of tomato juice seems to improve sperm motility in infertile patients. This is the first report to show that commercially available food, such as tomato juice, might be beneficial for male infertility.

Key Words: tomato, lycopene, male infertility, oxidative stress, sperm parameters



Recovery of Lactobacillus casei strain Shirota (LcS) from the intestine of healthy Vietnamese adults after intake of fermented milk

TRUONG TUYET MAI, DUONG VAN HOP, TRINH THI VAN ANH AND NGUYEN THI LAM

To demonstrate the gastrointestinal survival of Lactobacillus casei strain Shirota (LcS) in healthy Vietnamese adults, a fermented milk drink containing LcS was administered daily for 14 days. Twenty-six healthy Vietnamese adults took part in the study. Each participant consumed 65 mL of a fermented milk drink containing LcS daily for 14 days. The drink contained a dose of 108 CFU/mL LcS. Fecal samples were collected before, during and after consuming the fermented milk drink. LcS was confirmed by culture and ELISA. After 7 and 14 days of ingesting fermented milk drink, LcS was recovered from fecal samples at average of 5.0×10^7 CFU/g feces (n=26) and 5.4×10^7 CFU/g feces (n=26), respectively. LcS persisted in 8 volunteers until day 42 (after 14 days stopping fermented milk drink) at 0.0033×10^7 CFU/g feces (n=8). We confirmed survival of LcS after passage through the gastrointestinal tract of Vietnamese adults.

Key Words: Lactobacillus casei Shirota, fermented milk drink, Vietnamese adults, probiotic, survival



Increased dietary zinc and vitamin B-2 is associated with increased alanine aminotransferase in Taiwanese adolescents

CHYI-HUEY BAI, YI-WEN CHIEN, TZU-CHIEH HUANG, SHIN-JIUAN WU, NAI-HUAYEH, WEN-HARN PAN AND JUNG-SU CHANG

Background and Objectives: Alanine aminotransferase (ALT) is generally used for evaluating liver function, and its concentrations are closely associated with sex and nutritional status. This study investigates the relationships between dietary components and serum ALT activity in Taiwanese adolescents. Methods and Study Design: Data were collected from 1,941 adolescents aged 13-18 years who participated in the fourth National Nutrition and Health Survey in Taiwan (2010-2011, adolescents). Results: The mean age was 15.3 ± 0.1 y (15.3 ± 0.1 y for boys and 15.2 ± 0.1 y for girls). Mean serum ALT was 14.8 ± 13.3 U/L (17.7 ± 16.3 U/L for boys and 12.1 ± 8.7 U/L for girls; $p < 0.001$). Multivariate analysis revealed that, among girls, a single-unit increase in dietary zinc was associated with 1.12- and 1.11-fold increases in risk for increased serum ALT tertile 2 (T2) and T3, respectively, compared with T1; and a single-unit increase in vitamin B-2 intake increased risk by 1.71- and 1.54-fold, respectively. Further analysis revealed that the risk increase for boys and girls who consumed the highest amounts of dietary zinc and vitamin B-2 (T3) was 1.97- and 2.62-fold, respectively; they were also more likely to have higher serum ALT (>11 U/L for boys and >9 U/L for girls) than those of the reference (presented as zinc T1 and vitamin B-1 T1). Conclusions: Increased dietary zinc and vitamin B-2 intake is associated with higher serum ALT in adolescents.

Key Words: dietary zinc, dietary vitamin B-2, serum alanine aminotransferase, hepatic injury, adolescents



Does vitamin D affect muscle strength and architecture? An isokinetic and ultrasonographic study

MURAT KARA, TIMUR EKIZ, ÖZGÜR KARA, TÜLAY TIFTIK, FEVZIYE ÜNSAL MALAS, SIBEL ÖZBUDAK DEMIR AND NE E ÖZGIRGIN

Background and Objectives: The objective of this study was to explore the association between 25-hydroxyvitamin D (25(OH)D) and muscle strength/architecture. **Methods and study Design:** Thirty patients (27 women, 3 men) were allocated into Group I (n=15, mean age; 44.4±9.4 years) and Group II (n=15, mean age; 39.0±9.9 years) according to the median of 25(OH)D (<13.7 ng/mL vs >13.7 ng/mL, respectively). Peak torque/body weight of the knee flexor/extensor muscles at 60°/sec and 180°/sec and those of ankle flexor/extensor muscles at 30°/sec and 90°/sec were evaluated by using a Biodex System 3 Pro Multijoint System isokinetic dynamometer. A 7-12 MHz linear array probe was used to evaluate thickness (MT), pennation angle (PA) and fascicle length (FL) of medial gastrocnemius and vastus lateralis muscles. **Results:** Mean of 25(OH)D was 9.4±2.5 ng/mL and 20.7±8.3 ng/mL in Groups I and II, respectively. Although all isokinetic strength parameters were lower in Group I, significant differences were found in knee flexion at 180°/sec (p=0.007), knee extension at 30°/sec (p=0.038) and 180°/sec (p=0.001), and ankle extension at 30°/sec (p=0.002) and 90°/sec (p=0.007). On the other hand, no significant difference was found between the groups regarding MT, PA and FL values (all p>0.05). **Conclusion:** In light of our results, we can argue that 25(OH)D is associated with muscle strength but not with muscle architecture. Further studies concerning the long-term follow-up effects of 25(OH)D treatment on muscle strength are awaited.

Key Words: muscle strength, isokinetic, 25-hydroxyvitamin D, muscle architecture, ultrasound



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Dietary fiber intake is inversely associated with risk of pancreatic cancer: a meta-analysis

QI-QI MAO, YI-WEI LIN, HONG CHEN, JIE QIN, XIANG-YI ZHENG, XIN XU AND LI-PING XIE

Background and Objectives: The association between fiber intake and pancreatic cancer risk is conflicting and poorly explored. The aim of study was to investigate the association between dietary fiber intake and the risk of pancreatic cancer by conducting a meta-analysis of epidemiological studies. **Methods and Study Design:** Systematic search of PubMed and Embase databases up to April 2015 were conducted to identify relevant studies. Adjusted odds ratios (ORs) were combined using random-effects models to assess the risk of pancreatic cancer when comparing extreme categories of fiber intake. Dose-response meta-analysis was performed for studies reporting categorical risk estimates for at least 3 exposure levels. **Results:** One cohort and thirteen case-control studies were identified. The overall analysis revealed a strong inverse association between risk of pancreatic cancer and high fiber intake (OR 0.52; 95% CI 0.44-0.61). No publication bias was detected by Egger's or Begg's test. The dose-response analyses showed that the summary OR for an increment of 10 g daily intake of fiber was 0.88 (0.84 to 0.92). **Conclusion:** A high intake of dietary fiber was associated with a reduced risk of pancreatic cancer. Further well-designed prospective studies are warranted to confirm the inverse association and to identify the dietary fiber types involved.

Key Words: dietary fiber, epidemiology, meta-analysis, nutrition, pancreatic cancer



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Local food supplementation and psychosocial stimulation improve linear growth and cognitive development among Indonesian infants aged 6 to 9 months

HELMIZAR HELMIZAR, FASLI JALAL, NUR INDRAWATI LIPOETO AND ENDANG L ACHADI

Background and Objectives: To evaluate the effect of culturally-relevant food supplementation and psychosocial stimulation on infant growth and development. **Methods and Study Design:** A community-based random-ized controlled trial was conducted in 40 clusters from 5 selected villages in Tanah Datar District of West Sumatera, Indonesia. We assessed 355 infants aged 6 to 9 months at the beginning of the study. The infants were divided into 4 groups: 1) Food Supplementation (FS); 2) Psychosocial Stimulation (PS); 3) Food Supplementation and Psychosocial Stimulation (FS+PS); and 4) Control Group (CG). The formula food supplement was comprised of a variety of local food sources (local MP-ASI) and adjusted for the local habits. The quality of psychosocial stimulation was assessed with the Infant HOME inventory method.

Progress at 6 months was assessed by anthropometry and the Bayley scores of cognition, language and motor function. Results: There were improvements in linear growth, cognitive and motor development of children in the FS ($p < 0.05$) and the FS+PS ($p < 2.41$ cm for FS and FS+PS respectively ($p \pm 2.08$ cm and 6.66 ± 0.01) groups compared to the CG. After six months of intervention, mean length increased to $6.86 < 12.2$ points (effect size 0.56) ($p \pm 0.05$). With the combination of food supplementation and psychosocial stimulation (FS+PS), cognitive development increased to $21.4 < 18.4$ points (effect size 0.50) ($p \pm 0.01$) and motor development increased to $20.7 < 0.001$). Conclusion: Combined intervention with local food supplementation and psychosocial stimulation improved infant growth, cognitive and motor development.

Key Words: food supplementation, psychosocial stimulation, growth and development, infants, Indonesia



Nutrient intake and dietary patterns in children 2.5-5 years of age with picky eating behaviours and low weight-for-height

SHERI VOLGER, XIAOYANG SHENG, LING M TONG, DONGMEI ZHAO, TING FAN, FENG ZHANG, JOHN GE, WING MAN HO, NICHOLAS P HAYS AND MANJIANG YAO

Background and Objectives: Picky eating behaviours are common in young children and may adversely affect dietary intake. This study examined the adequacy of dietary patterns and nutrient intake in preschool-aged children in China and Hong Kong with picky eating behaviours and weight-for-height in the lowest quartile of the WHO Growth Standards. **Methods and Study Design:** Dietary intake was assessed using baseline 3-day food records from a multicenter, randomized trial in Chinese children (N=151) ages 2.5-5 years characterized as picky eaters by their parents and with weight-for-height 25th percentile of the WHO Growth Standards. Nutrient intakes were calculated using validated dietary analysis software and compared with age-appropriate Chinese Recommended Nutrient Intakes (RNIs). Dietary patterns were compared with Hong Kong Food Pyramid recommendations. Results: Median daily energy intake was 25% lower than the age-appropriate RNI, while median intakes of calcium, iron, zinc, and vitamins C and E ranged from 52%-73% of the RNI. Vitamin D intake was only 37% of the RNI. Total fat and sodium intakes exceeded recommendations by 10% and 56%, respectively, while >16% of daily energy was derived from foods in the sweets/beverages/snack and the fats/oils groups. Almost 75% of the children met the recommended daily servings of meat/meat substitutes and nearly half met the recommendation for daily servings of fruit. Fewer met the recommendations for daily servings of vegetables (14.7%), milk/milk products (6.3%), and grains and cereals (6.3%). **Conclusions:** Young children with picky eating behaviours and low weight-for-height had suboptimal dietary patterns and were at risk for significant dietary and nutrient insufficiencies.

Key Words: picky eating, fussy eating, poor eating, preschooler, dietary intake



Identifying acceptability and price points for purchasing micronutrient powders for children 2 to 5 years old in Nepal

RAJNI GUNNALA, CRIA G PERRINE, GIRIRAJ SUBEDI, SABA MEBRAHTU, PRADIUMNA DAHAL AND MARIA ELENA JEFFERDS

Background and Objective: Little is known about purchasing micronutrient powders (MNP) for children 2-5 years. We describe acceptability for purchasing and price points for MNP for children 2-5 years among caregivers living in districts where free MNP are distributed for children 6-23 months. **Methods and Study Design:** Cross-sectional surveys conducted 3 months after MNP program implementation in 2 districts; 15 months after implementation in 2 different districts. Chi square tests and logistic regression describe associations among sociodemographics and program exposure factors and acceptability of purchasing MNP among 1,261 mothers of children 6-23 months who had heard of MNP. Results: Overall, 77.5% and 86.1% of mothers reported acceptability for purchasing MNP in the 3 and 15 month surveys, respectively. Positive pricing

attitude (PPA) about paying 150 Nepali rupees for 60 sachets of MNP was reported by 66.3% and 73.4% of mothers. Acceptability for purchasing MNP in both time periods increased with higher wealth quintile and higher maternal education; PPA increased with higher maternal education. Controlling for socio-demographics, program exposure factors associated with acceptability for purchasing MNP included: lack of perceived barriers to MNP intake and health worker counselling (3 month surveys); knowledge of benefits of MNP intake and lack of perceived barriers to MNP intake (15 month surveys). Conclusions: Mothers reported acceptability for purchasing MNP and PPA for older children in Nepal. Differences in acceptability were found across socio-demographics and program exposures. Use of these results and further exploration into actual purchasing behaviour can inform future MNP distribution methods in Nepal.

Key Words: acceptability to purchase, micronutrient powders, Nepal, price points, iron



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Dietary intake, physical activity, and time management are associated with constipation in preschool children in Japan

KEIKO ASAKURA, SHIZUKO MASAYASU AND SATOSHI SASAKI

Background and Objectives: Constipation is a common complaint in children, which is not fatal but can affect quality of life. Several lifestyle-related risk factors for constipation have been reported, particularly dietary factors, but results have been inconsistent. Here, we examined the relationship of dietary and lifestyle factors with constipation in Japanese preschool children using data of a nationwide study. **Methods and Study Design:** Subjects were 5,309 children aged 5 to 6 years at 380 nursery schools in 44 of 47 prefectures in Japan. Children having three or fewer bowel movements per week were considered constipated. Dietary intake data was collected using a validated brief-type self-administered diet history questionnaire for Japanese preschool children, and information about general lifestyle was collected using a 4-page questionnaire designed for this study. Multivariate adjusted odds ratios for constipation were calculated by logistic regression. **Results:** Higher dietary fiber intake was significantly associated with a lower prevalence of constipation (adjusted odds ratio: 0.62, p for trend: 0.005), but higher carbohydrate intake was marginally associated with a higher prevalence of constipation. Intake of potatoes, pulses, vegetables, and fruits intake decreased constipation prevalence, whereas higher rice intake was significantly and independently associated with higher prevalence of constipation. Regarding lifestyle factors, high physical activity and sufficient preparation time for breakfast and dinner for guardians were significantly associated with lower prevalence. Prevalence tended to be negatively associated with a higher educational background of the mother. **Conclusions:** Several lifestyle factors were associated with a lower prevalence of constipation among Japanese preschool children, including dietary fiber intake.

Key Words: constipation, diet, physical activity, time management, Japanese preschool children



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Associations between depression and unhealthy behaviours related to metabolic syndrome: a cross sectional study

YUMI OHMORI, HIROTO ITO, AKEMI MORITA, KIJO DEURA, MOTOHIKO MIYACHI, FOR THE SAKU COHORT STUDY GROUP

Background and Objectives: The purpose of the present study was to determine whether depression was associated with metabolic syndrome and unhealthy behaviours in community residents. **Methods and Study Design:** Using the 2009-2010 baseline data of the Saku Cohort Study, 1,225 men and women who participated in a community health screening were included in the cross-sectional analyses. Depression was assessed using the Zung Self-Rating Depression Scale. Consistent with the Japanese Society of Internal Medicine's definition, we defined metabolic syndrome as abdominal obesity plus two or more of the following: high blood pressure,

hyperglycaemia, and dyslipidaemia. We defined 'pre- and metabolic syndrome' as the presence of one or more of the three criteria in addition to abdominal obesity. Results: There was no significant association between depression and metabolic syndrome. In women, the prevalence of pre- and metabolic syndrome was significantly higher in the depression group than that in the non-depression group (17.5% vs 9.5%, $p=0.046$), whereas no such significant association was observed in men. Logistic regression analysis showed that depression was associated with unhealthy behavioural factors differently in men and women. Conclusions: This study revealed that depression was associated with several unhealthy behavioural factors in both men and women, but depression was associated with pre- and metabolic syndrome only in women. These findings suggest that depression may be a warning sign of metabolic syndrome in women with unhealthy behavioural factors. Psychological factors should be considered in addition to the assessment of physical status.

Key Words: depression, metabolic syndrome, unhealthy behaviours, physical activity, dietary intake and habits



Positive association between the metabolic syndrome and white blood cell counts in Chinese

HONG YANG, YUAN-QING FU, BO YANG, JU-SHENG ZHENG, XIAO-YUN ZENG, WEN ZENG, ZHI-FEN FAN, MIN CHEN, LING WANG AND DUO LI

Background and Objectives: The aim was to investigate the association between peripheral circulating white blood cell count (WBC) and the metabolic syndrome among populations in central China. **Methods and Study Design:** In the present study, 5,278 subjects (2,412 women, 2,866 men) aged 18-75 years were recruited through a health check program in Wuhan, China. Biochemical and haematological parameters were measured by standard methods and the metabolic syndrome diagnosed as defined by the Chinese Diabetes Society criteria for Chinese. **Results:** Both WBC counts and prevalence of metabolic syndrome were significantly higher in men than in women ($p<0.01$). Participants in the highest quartile of white blood cell count had significantly higher odds ratio of metabolic syndrome (3.79, 95% CI: 2.64, 5.44), compared with subjects in the lowest quartile. The trend remained significant after adjustment for confounding factors and in further subgroup-analyses. **Conclusions:** Metabolic syndrome prevalence was significantly and positively correlated with the total white blood cell count in this Chinese population.

Key Words: metabolic syndrome, white blood cell count, cardiovascular risk, gender differences, Wuhan



Iron release from the Lucky Iron Fish®: safety considerations

GAVIN R ARMSTRONG, CATE E DEWEY AND ALASTAIR JS SUMMERLEE

Background and Objectives: The principal objective was to explore in greater detail safety issues with regard to the use of the Lucky Iron Fish® (fish) as a treatment for iron deficiency and iron deficiency anaemia in women in rural Cambodia. **Methods and Study Design:** Experiments were done to determine: (1) purity of the iron in the fish by mass spectroscopy; (2) release of iron and contaminants released during boiling in water using inductive-coupled plasma optical emission spectroscopy; (3) the impact of cooking time, acidity and number of fish in acidified water and two types of Khmer soups; and (4) drinkability of the water after boiling with different numbers of fish. **Results:** The fish is composed primarily of ferrous iron with less than 12% non-ferrous iron. Contaminants were either not detectable or levels were below the acceptable standards set by the World Health Organization. The length of time boiling the fish and the acidity of the water increased iron release but even with 5 fish boiled for 60 minutes, iron levels only approached levels where side effects are observed. Boiling one fish in water did not affect the perception of colour, smell or taste of the water but boiling in water with two or more fish resulted in the water

being unpalatable which further limits the potential for iron toxicity from using the fish. Conclusions: The results suggest that the Lucky Iron Fish™ may be a safe treatment for iron deficiency.

Key Words: Lucky Iron Fish®, anaemia, iron deficiency, food safety, iron release



Characteristics of food group intake by household income in the National Health and Nutrition Survey, Japan

NOBUO NISHI, CHIKA HORIKAWA AND NOBUKO MURAYAMA

This study examines the relationship between food group intake and household income in a representative Japanese population. A total of 11,015 subjects (5,127 men and 5,888 women) aged 20 to 79 years, in 5,475 households who were part of the National Health and Nutrition Survey, Japan, in 2010 and 2011 were analyzed. Dietary intake was recorded for one day in November for those aged one year and older, from 300 randomly selected survey districts. Household income per year was recorded in the questionnaire in three categories: low (<2 million yen), middle (2-6 million yen) and high (6 million yen). Multilevel regression modelling was applied to take into account the hierarchical data structure of subjects nested within households, and households nested within survey districts. Dichotomous variables divided at the median intake of each food group were used. In a model where sex, age, household size and population size of municipalities to which survey districts belonged were adjusted, the total energy intake was found to be highest in individuals from middle income households, and lowest for those from low income households. In models where a total energy intake was additionally adjusted, household members with low and middle incomes had a significantly higher intake of cereals, and a lower intake of potatoes and starches, pulses, vegetables, fruits, mushrooms, fish and shellfish, milk and seasonings and spices compared with those with high incomes. In conclusion, household members with lower incomes in Japan consumed more staple foods, but less vegetable, fruit and fish.

Key Words: household income, food group intake, multilevel modelling, National Health and Nutrition Survey, health inequality



Comparison of the nutrient-based standards for school lunches among South Korea, Japan, and Taiwan

MEEYOUNG KIM, SATOKO ABE, CHENGYU ZHANG, SOYOUNG KIM, JIYU CHOI, EMELY HERNANDEZ, MIHO NOZUE AND JIHYUN YOON

Nutritional standards are important guidelines for providing students with nutritionally-balanced school meals. This study compared nutrient-based school lunch standards regulated by South Korea, Japan, and Taiwan. The data were collected from relevant literature and websites of each country during September 2014. The number of classification groups of target students was 8, 5, and 5 for South Korea, Japan, and Taiwan, respectively. Gender was considered across all age groups in South Korea but only for high school students in Taiwan. Gender was not considered in Japan. Along with energy, the number of nutrients included in the standards for South Korea, Japan and Taiwan was 9, 12, and 4, respectively. The standards for all three countries included protein and fat among macronutrients. The standards for South Korea and Japan included vitamin A, B-1, B-2, and C, while the standards for Taiwan did not include any vitamins. Calcium was the only mineral commonly included in the three standards. The proportions of recommended daily intakes as reference values for each nutrient differed among the countries. Japan differentiated the proportions among 33%, 40%, or 50%, reflecting the target students' intake status of the respective nutrients. Taiwan differentiated either two-fifths or one-third of the recommended daily intakes. South Korea applied the proportion of recommended daily intake as one-third for all selected nutrients. This study could be valuable information for countries in developing nutrient-based standards for school lunches and for South Korea, Japan, and Taiwan in the process of reforming nutrient-based standards.

Key Words: school lunch program, nutrient-based standards, South Korea, Japan, Taiwan



Adults and children prefer a plate food guide relative to a pyramid

ZENOBIA TALATI, SIMONE PETTIGREW, SARAH MOORE AND IAIN S PRATT

Background and Objectives: This study explored attitudes toward two food guides currently being widely used in Australia: the Healthy Eating Pyramid and the Australian Guide to Healthy Eating Plate. **Methods and Study Design:** Ten focus groups were conducted with adults (aged 18+ years) and children (aged 10-17 years) across various locations in Perth, Western Australia. The discussions focused on liked and disliked aspects of each food guide and the implications for participants' perceptions of their relative usefulness. **Results:** When asked to state their preference, a large majority of participants nominated the plate as their preferred nutrition guide. The style of presentation used for the plate was reportedly clearer and more aesthetically pleasing. The plate was also perceived to be more complex while the pyramid was considered by adults to be more child-friendly. **Conclusions:** This study provides information on consumers' reactions to different food guides and the implications for perceived relevance and utility.

Key Words: food guide, nutrition education, children, healthy eating pyramid, healthy eating plate



Do demographic characteristics influence the eating competence of elderly Taiwanese?

KUEI-I LEE, WAN-TENG LIN AND, WEN-DEE CHIANG

Background and Objectives: To investigate the association between demographic characteristics and eating competence (EC), "the behaviour and attitudinal conceptualization of eating", among elderly Taiwanese. **Methods and Study Design:** Random questionnaire survey. Overall, 564 questionnaires were analyzed, and independent t-tests, analysis of variance, chi-square tests, were used to compare the differences in the EC scores when stratified by various demographic variables. **Results:** The mean score of both EC and non-EC (NEC) for all respondents was 29.3. Younger respondents (65-70 years old) reported significantly higher EC scores than did older respondents (71-76 years old) ($p < 0.05$). Similarly, respondents with high school or a higher education level reported higher scores than did respondents with elementary or a lower education level ($p < 0.001$), and respondents with partners had higher scores than did those with no partners ($p < 0.001$). Respondents who lived in urban areas reported higher EC scores than those living in rural areas ($p < 0.001$). No significant gender differences were found in both EC and NEC scores. **Conclusions and Implications:** Thirty-seven percent of elderly Taiwanese were not eating competent. Older respondents with higher education levels, those with partners, and those residing in urban areas showed significantly higher EC scores. Nutritional practitioners should therefore develop nutrition education programs tailored for those with low EC scores.

Key Words: eating competence, demographic characteristics, elderly, Taiwan



A rapid assessment and response approach for socially marketed nutrition commodities in Viet Nam

TAHIR TURK, NGUYEN DINH QUANG, TRAN THUY NGA, HUYNH PHUONG, LE VAN ANH TUNG AND VU HOANG TRANG

Background: The leading cause of death in children in developing countries is protein-energy malnutrition. In Viet Nam, 25.9% of children under 5 experience stunted growth and 6.6% are moderately wasted. Iron deficiency anaemia and vitamin A deficiency contribute to these and other malnutrition conditions. **Objectives:** Given these factors, more evidence based approaches

are required to improve understanding of current attitudes, opinions and behaviours of mothers with young children, in order to operationalise social marketing of nutrition commodities in Viet Nam. Methods and Study Design: A literature review supported a rapid assessment and response method involving semi-structured interviews with 77 stakeholders and focus group discussions with 80 program beneficiaries from four geographic locations in the north and south of Viet Nam. Discussion agendas were developed to address key program issues with grounded theory utilized for data analysis. Results: Data analysis highlighted challenges and opportunities within the six Ps of social marketing: Supply and demand side issues included: cost and the quality of products, the limited scale of interventions and promotional activities. Policy issues identified related to current policies that inhibited the broader promotion and distribution of micronutrient products, and opportunities for improved dialogue with policy partners. Partnerships further emphasized the need for public private partnerships to support the social change process. Conclusion: Implications for theory, policy, and practice indicates that rapid assessment and response is a cost-effective, pragmatic method of public health research, in resource constrained settings, to explore policies and behaviours amenable to change and build stakeholder engagement in the program.

Key Words: nutrition, malnutrition, needs assessment, rapid assessment and response, social marketing



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Original Article

Intergenerational effects of maternal birth weight, BMI, and body composition during pregnancy on infant birth weight: Tanjungsari Cohort Study, Indonesia

Gaga Irawan Nugraha MD, PhD¹, Herry Herman MD, PhD², Anna Alisjahbana MD, PhD³

¹Department of Biochemistry and Biomolecular, Faculty of Medicine, Universitas Padjadjaran, West Java, Indonesia

²Department of Orthopaedic and Traumatology, Faculty of Medicine, Universitas Padjadjaran, West Java, Indonesia

³Frontiers for Health, West Java, Indonesia

Background and Objectives: Infant birth weight might be partly contributed to by maternal nutritional status at birth and maternal nutrition during pregnancy. The objective of this study was to analyze intergenerational maternal birth weight, maternal BMI, weight change during pregnancy, and maternal body composition (FM, FFM, and TBW) changes during pregnancy. **Methods and Study Design:** We analyzed the associations between the maternal birth weight and body composition of 94 women and infant birth weight by using multiple regression adjusted for socioeconomic and reproductive history. **Results:** All associations with infant birth weight were positive. The association between infant birth weight and maternal birth weight was 0.28 (95% CI: 0.02–0.54); that for the association between infant birth weight and maternal body weight in the first, second, and third trimesters was 15.1 (95% CI: 4.92–25.3), 13.7 (95% CI: 2.78–24.6), and 16.1 (95% CI: 5.22–27.0), respectively. The association between infant birth weight and fat mass in the second and third trimesters were 18.4 (95% CI: 3.38–33.5) and 16.1 (95% CI: 5.23–27.0), respectively, and those for the association between infant birth weight and fat-free mass in the first and third trimesters were 33.6 (6.38, 60.9) and 34.8 (95% CI: 3.47–66.1), respectively. **Conclusions:** This study confirms previous findings that maternal birth weight and body composition during pregnancy are associated with infant birth weight.

Key Words: intergenerational, maternal birth weight, maternal BMI, maternal body composition, infant birth weight

INTRODUCTION

Birth weight is a critical factor influencing health during infancy and later life. Low birth weight (LBW; i.e., birth weight <2500 g) is an important risk factor for chronic diseases during adulthood, such as type 2 diabetes, hypertension, and CVD.^{1,2} The global prevalence of LBW is 15.5%, or approximately 20 million babies, of which 95.6% reside in developing countries. In Indonesia, 11.1% of babies exhibited LBW in 2010, and the number slightly decreased to 10.2% in 2013.³ Factors known to be related to LBW include maternal height, prepregnancy weight, weight gain during pregnancy, parity, maternal age at pregnancy, prenatal care, and maternal birth weight.⁴⁻⁷

Various studies have investigated the association between maternal and infant birth weights, but the results have been inconclusive.^{8,9} Several factors, including genetics predisposition, epigenetic effect, and sociocultural factors, are known to influence the intergenerational effect on LBW.¹⁰ A study investigating 558 women in Sao Paulo, Brasil, showed that maternal birth weight is associated with infant birth weight for infants weighing >3500 g but not for LBW infants.¹¹

A person's body weight consists of fat mass (FM), fat-

free mass (FFM), and total body water (TBW). During pregnancy, FM is associated with maternal BMI, whereas increases in FFM are an indicator of uterine, placental, and fetal growth.¹² Studies have shown that maternal prepregnancy BMI and weight change during pregnancy are significantly associated with infant birth weight, but results regarding the association between maternal body composition and infant birth weight have been inconsistent. In a study conducted in Jamaica, infant birth weight was found to be associated with maternal FFM, but not FM, in the first prenatal care visit (week 15 of pregnancy or earlier) and associated with an increase in FFM, but not FM, between the first prenatal care visit and week 35 of pregnancy.¹³ However, another study conducted in Sweden reported a correlation between infant

Corresponding Author: Dr Gaga Irawan Nugraha, Department of Biochemistry and Biomolecular, Faculty of Medicine, Universitas Padjadjaran, Jl. Raya Jatinangor-Sumedang, KM 22, Sumedang, Jawa Barat, Indonesia.

Tel: +62 81573001992; Fax: +62 22 2032173

Email: gagairawan@gmail.com

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