Children's Dietary Habits in Relation to Family Structure: An Epidemiological Study in 1728 Children and Their Families From Greece

Evangelia Damigou[1], Venetia Notara[1,2], Marialena Kordoni[1], Anna Velentza[1], Magdalini Mesimeri[1], George Antonogeorgos[1], Christos Prapas[2], Eleni Kostantinou[2], Pelagia Soultatou[2], Andrea Paola Rojas-Gil[3], Ekaterina N. Kornilaki[4], Demosthenes B. Panagiotakos[1]

[1]Department of Nutrition and Dietetics, School of Health Science and Education, Harokopio University, Athens, Greece
[2]Department of Public and Community Health, School of Health Sciences and Welfare, University of West Attica, Athens, Greece
[3]Department of Nursing, Faculty of Human Movement and Quality of Life Sciences, University of Peloponnese, Sparta, Greece
[4]Department of Preschool Education, School of Education, University of Crete, Greece

ABSTRACT

Aims: Unhealthy dietary habits are widespread with obesity being the prime ramification of unhealthy dietary habits and one of the major health problems for children, with consequences later in life. This study aimed to evaluate and compare the dietary habits of children in relation to various family structures. **Methods:** A cross-sectional survey was conducted including 1728 children, aged 10–12 years and their parents, during school years 2014–2016 (details for family structure were available for 1120 children). Primary schools from 5 Greek counties (including Athens metropolitan area) were randomly selected. Parental and child data were collected through self-administered, anonymous questionnaires. **Results:** Data analysis revealed no statistically significant associations between family structure and children's dietary habits. Concerning other dietary habits, consumption of food outside of home was associated with family structure ($p = 0.038$). **Conclusion:** Research on family structure and dietary habits of children is scarce, thus, in order to conclude with certainty if an association exists, more studies should be performed.
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Key words: *Family structure, dietary habits, children*

ΠΕΡΙΛΗΨΗ

Διατροφικές συνήθειες παιδιών και οικογενειακή δομή: Μια επιδημιολογική μελέτη σε 1728 παιδιά και τις οικογένειές τους απο την Ελλάδα

Ευαγγελία Δαμίγου[1], Βενετία Νοταρά[1,2], Μαριαλένα Κορδόνη[1], Άννα Βελεντζά[1], Μαγδαληνή Μεσημέρη[1], Γεώργιος Αντωνογεώργος[1], Χρήστος Πράπας[2], Ελένη Κωνσταντίνου[2], Πελαγία Σουλτάρου[2], Andrea Paola Rojas-Gil[3], Αικατερίνη Ν. Κορνηλάκη[4], Δημοσθένης Β. Παναγιωτάκος[1]

[1]Τμήμα Επιστήμης Διαιτολογίας - Διατροφής, Σχολή Επιστημών Υγείας & Αγωγής, Χαροκόπειο Πανεπιστήμιο
[2]Τμήμα Δημόσιας και Κοινοτικής Υγείας, Σχολή Επιστημών Υγείας και Πρόνοιας, Πανεπιστήμιο Δυτικής Αττικής
[3]Τμήμα Νοσηλευτικής, Σχολή Επιστημών Ανθρώπινης Κίνησης και Ποιότητας Ζωής, Πανεπιστήμιο Πελοποννήσου, Σπάρτη
[4]Παιδαγωγικό Τμήμα Προσχολικής Εκπαίδευσης, Πανεπιστήμιο Κρήτης

Στόχοι: Οι ανθυγιεινές διατροφικές συνήθειες είναι ευρέως διαδεδομένες, με την παχυσαρκία να είναι η κύρια συνέπεια των ανθυγιεινών διατροφικών συνηθειών και ένα από τα σημαντικότερα προβλήματα υγείας

Αλληλογραφία: Prof. Demosthenes B. Panagiotakos,
Department of Nutrition and Dietetics, School of Health Science
and Education, Harokopio University,
176 71 Athens, Greece
E-mail: dbpanag@hua.gr

για τα παιδιά, με συνέπειες αργότερα στη ζωή. Η μελέτη αυτή αποσκοπούσε στην αξιολόγηση και σύγκριση των διατροφικών συνηθειών των παιδιών σε σχέση με τις διάφορες οικογενειακές δομές. **Μέθοδοι:** Διεξήχθη μια συγχρονική έρευνα που περιελάμβανε 1728 παιδιά, ηλικίας 10-12 ετών και τους γονείς τους, κατά τα σχολικά έτη 2014-2016 (στοιχεία για τη δομή της οικογένειας ήταν διαθέσιμα για 1120 παιδιά). Τα δημοτικά σχολεία από 5 ελληνικές περιοχές (συμπεριλαμβανομένης της μητροπολιτικής περιοχής της Αθήνας) επιλέχθηκαν τυχαία. Τα στοιχεία γονέων και παιδιών συλλέχθηκαν μέσω αυτοδιαχειριζόμενων, ανώνυμων ερωτηματολογίων. **Αποτελέσματα:** Η ανάλυση δεδομένων δεν αποκάλυψε στατιστικά σημαντικές συσχετίσεις μεταξύ οικογενειακής δομής και διατροφικών συνηθειών των παιδιών. Όσον αφορά άλλες διατροφικές συνήθειες, η κατανάλωση τροφίμων εκτός του σπιτιού συσχετίστηκε με την οικογενειακή δομή (p = 0,038). **Συμπέρασμα:** Η έρευνα σχετικά με τη δομή της οικογένειας και τις διατροφικές συνήθειες των παιδιών είναι σπάνια, επομένως, για να καταλήξει κανείς με βεβαιότητα εάν υπάρχει συσχέτιση, περισσότερες μελέτες πρέπει να διεξαχθούν. *Hellenic J Nutr Diet 2018, 5(2):73-80*

Λέξεις κλειδιά: Οικογενειακή δομή, διατροφικές συνήθειες, παιδιά

1. Introduction

As children start to develop and grow, they may exhibit certain behaviours, including dietary behaviours. In this age group, knowledge is easily transmitted, either through the family environment, school setting or the mass media. It is widely acknowledged that a healthy and balanced diet is of great importance for the child's health and growth. However, many children still have unhealthy eating habits and behaviors. As Aristotle said, "there is a difference between what is known and what we know". For example, in a study conducted in Italy during 2012, 43.9% of children aged 8-9 years old had several unhealthy attitudes, including dietary[1]. However, given the young age of children, one may wonder if parents are to be blamed for the wrong eating habits of children, since they are usually the main caregivers of children. John Locke (29 August 1632 – 28 October 1704, an English philosopher and physician, one of the most influential of Enlightenment thinkers, known as the "Father of Liberalism") said: "*children are tabula rasa, blank canvases, whatever knowledge they have is gained from experience and interaction with their environment*". So, it is not just the parents that affect the children, but the entire family structure, e.g., the presence of siblings, grandparents, guardians, etc. In particular, the concept of family structure includes those who affect children's behaviour, including their eating habits. The family environment, which inevitably encompasses a child's domestic life, plays a pivotal role in establishing behaviors that may persist over the lifespan. Parental eating habits have been found as dominant determinants of a child's eating behaviors and food choices[2,3]. Family, as a social apparatus, not only offers knowledge to the younger members as regards food and nutrition, but also serves as a "role" model[4] through the quality of purchased foods and eating habits[5]. In addition, school environment plays an important role in creating children's character and behaviors. However, the literature on the structure of the family, and its effect on children's eating habits is rare and heterogeneous; for example there are studies revealing that the number of siblings or the presence of grandparents or the presence of a single parent seems to play a role, while there are other studies showing no association[6-12]. To the best of our knowledge there is not such study examining the role of family structure on children's dietary behavior in Greece. Thus, this study aimed to explore if an association exists between family structure and children's dietary habits, in setting of 1728 children and their families from various Greek regions.

2. Methods

2.1. Participants and sampling procedures

The study was conducted in the greater metropolitan Athens area, in Heraklion (Crete), and in Sparta, Kalamata, and Pyrgos (Peloponesse), during the school years 2014–2015 and 2015–2016. A total of 1728 students (785 males), aged 10–12 years of age, attending the 5th and 6th grade of primary school, were enrolled in the study. The specific regions were selected mainly on a feasibility basis, but they also represent large urban and rural municipalities from Greece, and therefore, a more representative sample could be considered that it was obtained. Schools were selected using random sampling from a list of

schools provided by the Greek Ministry of Education. In total, 47 schools were selected (32 from Athens, 5 from Heraklion, Crete, 3 from Pyrgos, 2 from Kalamata, and 5 from Sparta). Parental written consent was obtained before enrolling children in the study. Participation rate ranged from 95% to 100% between schools, without any significant differences between the studied areas. All children's parents were also invited to participate, with 68.9% response rate being achieved, i.e., n=1190; this is the working sample of children and parents of the present analysis. The working sample was adequate to evaluate effect size measures' differences of 20% at <5% level of significance, achieving 85% statistical power.

2.2. Children and parent questionnaires

Each child was asked, by the study's investigator or the school teacher (in the cases that school's principal did not allow to the study's investigator to enter to the classes), to complete an anonymized questionnaire. To increase the accuracy of responses, the investigator, in collaboration with children's teachers, assisted using practical examples. The questionnaire consisted of questions assessing, among others, daily activities, such as dietary habits, physical activity, and knowledge, as well as questions about self-perceptions and stress management. A team of experts in the field of public health, psychology and school performance were involved in the development of the questionnaires. For the purpose of the present study, data on (a) demographic characteristics (age, gender) and (b) anthropometric measurements (height and weight for BMI calculation) using scale and tape measure, over skin-tight clothes, (c) dietary habits of children, using Food Frequency Questionnaires (FFQ), with foods from all the food groups, were evaluated.

Parental questionnaires were given to the children, in order to be completed by any of their parents at home and they were asked to return the completed questionnaires to the school setting. In most cases, questionnaires were completed by one parent, usually by the mother (75%). Parental questionnaires consisted of questions on (a) anthropometric self-reported data (height and weight for BMI calculation), (b) family demographic characteristics (marital status), and (c) socioeconomic characteristics (maternal and paternal educational level).

2.3. Assessment of Family characteristics

Family Structure In order to define family structure, a latent variable was computed with the combined answers for family's marital status and the number of siblings. Specifically, marital status was classified into 5 categories (i.e., married, widowed, divorced, unmarried with cohabitation, unmarried without cohabitation). Since the majority of the children reported married parents (88.6%) and in order to achieve better sample distribution, all other categories were included into "not currently married"; therefore, 2 categories were considered in the analyses: a) "married", and b) "not married". The number of siblings varied from none to 8 siblings, but with a considerable skewed distribution to the right; thus, for the same reason as aforementioned, two final categories were used: a) "no siblings", b) "siblings" (for children with at least one sibling). Therefore, cumulatively, children's family structure had 4 categories: a) "Only-children with married parents" (for children with married parents and no siblings), b) "Children with married parents and siblings" (for children with married parents and at least one sibling"), c) "Only-children with unmarried parents", and d) "Children with unmarried parents and siblings".

Dietary Habits Assessment In order to assess the overall dietary habits of the children a score named "Food Balance Score" was computed as the following ratio:

$$\text{Food Balance Score} = \frac{\text{Frequency of consumption of healthy foods}}{\text{Frequency of consumption of unhealthy foods}}$$

The frequency of consumption of foods was used based on FFQs, and it was standardized to servings per day, before being used for the calculations. Healthy and unhealthy foods were categorized based on the Mediterranean diet rationale. "Healthy foods" included: Milk, Fresh juices, Yoghurt, Fish, Chicken, Legumes, Baked potatoes, Vegetables, Fruits, Whole wheat bread, Olive oil, while "Unhealthy foods" included: Sugar, Cacao, Soft drinks, Packaged juices, Beef/Pork, French Fries, Chocolate/Croissants/Biscuits, Potato chips, Alcohol, White bread, Cotton seed oil. Since no validation analysis has been performed, this quantitative food consumption balance variable was then dichotomized, i.e., >1 = prone to healthy eating habits or <1 = prone to unhealthy eating habits, and used as categorical in multivariate analyses.

Additionally, 5 other dietary habits were included, as categorical variables:
1) Breakfast consumption (Yes/No)
2) Frequency of family meals (None/Less than once a month, 1-3 times per month, 1 time per week, 2-6

times per week, 1 time per day, More than 2 times per day)

3) More than 3 meals per day (Yes/No)
4) Delivery Food (Yes/No)
5) Food consumption outside of home (Yes/No).

Anthropometric measurements For children, weight status was categorized using the age- and gender-specific International Obesity Task Force (IOTF) Body Mass Index (BMI) cutoff criteria[13]. Parental weight status was defined based on the WHO (BMI, in kg/m²) cutoffs: underweight: <18.5 kg/m², normal weight: 18.5–24.9 kg/m², overweight: 25–29.9 kg/m², and obese: >30 kg/m². BMI was calculated as weight (in kilograms) divided by height (in meters) squared.

Parental educational level Educational level was classified into (a) lower secondary or less, including all individuals having completed <9 years of schooling, (b) higher secondary education, for those having completed 12 years of mandatory education, (c) post-secondary education, for those with a Bachelor or higher degree.

2.4. Bioethics

The study was approved by the Institute of Educational Policy of the Ministry of Education and Religious Affairs (code of approval F15/396/72005/C1) and was carried out in accordance with the Declaration of Helsinki (1989). The school principals, teachers, parents, and students were informed about the aims and procedures of the study. A signed parental consent was obtained before the completion of the questionnaires.

2.5. Statistical analysis

Group mean differences were tested using Analysis of Variance (ANOVA). Pearson's Chi-squared test was used to examine associations between categorical variables. Univariate and multivariate analyses were applied. Multiple logistic regression was used to determine the likelihood of children having unhealthy dietary habits (food balance score <1), according to family structure. Parental educational level and BMI, as well as children's age, gender, BMI was used as an adjustment factor, due to a-priory evidence of potential association with children's dietary habits. All analyses were conducted using STATA 14.0 (Stata Corp LP, College Station, Texas, Ltd, M. Psarros & Assoc, Sparti, Greece).

3. Results

The structure of the families included in the present study was: 87.8% married, 1.1% widowed, 9.6% divorced, 0.9% cohabitants, 0.7% unmarried without cohabitation. Moreover, the distribution of number of siblings among children participants was: 11.1% with no siblings, 57% with one brother or sister, 24.2% with 2 siblings, 6.4% with 3 siblings, 1.1% with 4 siblings, 0.2% with 5 siblings and 0.1% with 8 siblings. After combining the groups as reported in Methods section, 9.5% were only-children with married parents, 79.1% were children with married parents and at least one sibling, 2% were only-children with unmarried parents and 9.5% were children with unmarried parents and siblings.

As it is presented in Table 1, the Food Balance Score was greater than 1, suggesting that children tended to have healthier rather than unhealthier dietary habits. No differences were observed between family structure categories on Food Balance Score values; this was evident in both boys and girls (*p*=0.9). Moreover, no association was observed between the Food Balance Score and children's age (*p*=0.9) and gender (*p*=0.9). Children and parents' sociodemographic and anthropometric characteristics are also presented in Table 1. An association was observed between family structure and parental educational level. The majority of married fathers with an only-child reported higher educational level (57.3%, *p*=0.024). This percentage was even higher (65.2%, *p*=0.0001) for married mothers with an only-child.

To further account for potential confounders, multiple logistic regression analysis was applied. The results are presented in Table 2. Although, there seemed to be a trend, the results were not statistically significant, thus, no difference was found in the dietary habits of children between the different categories of family structure.

Furthermore, as it is presented in Table 3, other dietary habits, namely: "Breakfast consumption", "Frequency of family meals", consumption of "More than 3 meals per day", and consumption of "Delivery food" of children were not associated with family structure. However, "Food consumption outside of home" was associated with family structure (*p*= 0.038). Specifically, even though the majority of all types of family structure didn't consume food outside of home, out of all family structures, it was children with unmarried parents and siblings that had the biggest percentage of food consumption outside of home (42.9%), followed by only-children with married parents (41.8%), children with married parents and siblings (35.7%) and lastly, only-children with unmarried-parents (10.5%).

TABLE 1. Child and parents' characteristics according to family structure.

	Only-children with married parents	Children with married parents and siblings	Only-children with unmarried parents	Children with unmarried parents and siblings	p
Child's age (years)	11.1±0.7	11.1±0.7	11.2±0.8	11.2±0.7	0.919
Child's gender					0.892
Boys	38 (41.8%)	327 (43.4%)	7 (41.2%)	35 (39.3%)	
Girls	53 (58.2%)	426 (56.6%)	10 (58.8%)	54 (60.7%)	
Child's BMI (kg/m^2)	18.6 (±2.9)	18.9 (±3.2)	19.7 (±3.2)	19.1 (±3.2)	0.527
Food Balance Score	1.328±0.398	1.347±0.435	1.304±0.454	1.312±0.435	0.950
Father's BMI (kg/m^2)	27.1 (±3.1)	27.0 (±3.6)	28.3 (±3.8)	26.9 (4.3)	0.624
Mother's BMI (kg/m^2)	23.9 (±3.8)	24.1 (±3.9)	22.9 (±5.3)	23.8 (±4.6)	0.641
Father's educational level					0.024
Lower secondary or less	8 (9.0%)	105 (14.1%)	3 (17.6%)	19 (22.4%)	
Higher secondary	30 (33.7%)	339 (45.4%)	8 (47.1%)	35 (41.2%)	
Post-secondary	51 (57.3%)	302 (40.5%)	6 (35.3%)	31 (36.5%)	
Mother's educational level					0.0001
Lower secondary or less	5 (5.6%)	62 (8.3%)	1 (5.6%)	16 (18.8%)	
Higher secondary	26 (29.2%)	355 (47.6%)	8 (44.4%)	35 (41.2%)	
Post-secondary	58 (65.2%)	329 (44.1%)	9 (50.0%)	34 (40.0%)	

Note: Food Balance Score >1 indicates healthier dietary habits

4. Discussion

In this study, we aimed to explore the association between the family structure and the dietary habits of children. After taking into account children's dietary habits, and classifying them as healthier and unhealthier, no statistically significant association was found between the food balance of heathier vs. unhealthier habits with their family's structure. Concerning other dietary habits, consumption of food outside of home was associated with family structure (*p*= 0.038). Despite the common perception that children's behaviors are strongly affected by the environment they live and grow, the present work revealed that children's dietary habits were not associated with the structure of their family. This finding may hide other factors within the family that may play a role in forming children's dietary habits and behaviors, that were not evaluated in the present study.

Dietary habits of children may vary for several reasons, e.g., the absence of nutritional knowledge of their parents or guardians or any other person who is responsible for their nutrition, the absence of healthy role-models within their environment, food insecurity, etc[14-17]. As a consequence, obesity is the prime result of unhealthy dietary habits and one of the major health problems for children[18], with effects later in life[19,20]. Considering the high importance of the problem regarding the adoption of unhealthy dietary habits by the children and the factors that influence them, family structure seems to be a reasonable component, as it is widely adopted that parents, guardians play the role of models for their children. There are some studies that evaluated the dietary habits of men and women in association with marital transitions. It was found that divorce, separation and widowhood have unhealthy changes in the dietary habits of these adults[21], while another study found that divorce and widowhood have both healthy and unhealthy changes in dietary habits[22]. Concerning children, a study has found that children with divorced parents consume "sugar-sweetened beverages" more often and breakfast less often than children living with both their parents[23]. Moreover, according to the Millennium Cohort Study[24],

TABLE 2. Results from multiple binary logistic regression models that evaluated the role of family structure on children's dietary habits, as assessed through a Food Balance Score (the higher values the healthier the diet).

	Model 1	Model 2	Model 3	Model 4
Family structure				
Only-children with married parents (reference category)	1.00	1.00	1.00	1.00
Children with married parents and siblings	1.212 (0.541-2.715)	1.129 (0.500-2.548)	1.168 (0.458-2.811)	1.114 (0.455-2.729)
Only-children with unmarried parents	1.700 (0.278-10.405)	0.921 (0.089-9.576)	-	-
Children with unmarried parents and siblings	1.371 (0.480-3.915)	1.260 (0.435-3.647)	1.208 (0.346-4.226)	1.232 (0.342-4.445)
Child's age (per 1 year)	-	1.454 (1.076-1.965)	1.266 (0.909-1.764)	1.236 (0.884-1.729)
Child's gender (M/F)	-	0.724 (0.465-1.129)	1.036 (0.615-1.744)	1.057 (0.620-1.800)
Child's BMI (per 1 Kg/m2)	-	-	1.123 (1.035-1.218)	1.115 (1.027-1.211)
Father's BMI (per 1 Kg/m2)	-	-	0.991 (0.923-1.064)	0.995 (0.927-1.068)
Mother's BMI (per 1 Kg/m2)	-	-	1.015 (0.953-1.081)	0.999 (0.937-1.066)
Father's educational level (Post-secondary vs. other)	-	-	-	1.000 (0.651-1.538)
Mother's educational level (Post-secondary vs. other)	-	-	-	0.756 (0.485-1.179)

Results are presented as Odds Ratios (OR) and 95% confidence intervals.

which studied the changes in family structure after a 5-year follow-up, "*continuously married families*" had, among other characteristics, the highest incomes which has been associated with better dietary habits. In contrast, "*families who remained lone parents*" had, among other disadvantageous characteristics, the lowest income and economic disadvantages, with some of them (30%) having experienced poverty at least one time, which has been associated with food insecurity and unhealthy dietary habits[25,26]. On the same line of thought, the finding of this study, that food consumption outside of home was associated with family structure (*p*= 0.038), may be explained by the economic crisis, because economic crisis and economic reasons impact the eating habits of people as well as their social life[27,28].

However, to the best of our knowledge no study has been performed for the evaluation of dietary habits of children in relation to their family structure. The present study observed no association between family structure and children's dietary habits. This may be a true outcome or a result due to several biases. Specifically, whether children are living with both parents or not, or whether they have siblings or not, may truly not play a certain role in developing healthier or unhealthier dietary habits; other factors, within children's micro-environment, may be studied to reveal which of them form their dietary habits and behaviors. On the contrast, the finding presented here may be prone to bias and due to confounding. In particular, this is an observational study and has, therefore, some limitations that should be considered. No temporal relationship and hence causal inferences can be made. Furthermore, the sample was originated from specific parts of Greece, which limits the generalizability of the findings to the entire Greek children's population aged 10–12 years.

TABLE 3. Children's dietary habits in different family structures

	Only-children with married parents	Children with married parents and siblings	Only-children with unmarried parents	Children with unmarried parents and siblings	p
Breakfast consumption					0.189
Yes	86 (94.5%)	714 (93.9%)	16 (84.2%)	82 (90.1%)	
No	5 (5.5%)	46 (6.1%)	3 (15.8%)	9 (9.9%)	
Frequency of family meals					0.111
None/Less than once a month	3 (3.3%)	7 (0.9%)	1 (5.3%)	2 (2.2%)	
1-3 times per month	2 (2.2%)	27 (3.6%)	2 (10.5%)	8 (9%)	
1 time per week	7 (7.8%)	66 (8.9%)	2 (10.5%)	13 (14.6%)	
2-6 times per week	25 (27.8%)	213 (28.7%)	5 (26.3%)	18 (20.2%)	
1 time per day	30 (33.3%)	209 (28.1%)	5 (26.3%)	21 (23.6%)	
More than 2 times per day	23 (25.6%)	221 (29.7%)	4 (21.1%)	27 (30.3%)	
More than 3 meals per day					0.236
Yes	52 (57.1%)	365 (48%)	12 (63.2%)	46 (50.5%)	
No	39 (42.9%)	395 (52%)	7 (36.8%)	45 (49.5%)	
Delivery Food					0.757
Yes	48 (52.7%)	372 (48.9%)	11 (57.9%)	43 (47.3%)	
No	43 (47.3%)	388 (51.1%)	8 (42.1%)	48 (52.7%)	
Food consumption outside of home					0.038
Yes	38 (41.8%)	271 (35.7%)	2 (10.5%)	39 (42.9%)	
No	53 (58.2%)	489 (64.3%)	17 (89.5%)	52 (57.1%)	

Results are presented as follows: Number and percentage of children in each category of family structure

A potential limitation may also be reporting bias due to the self-reporting questionnaires. The presence of a trained investigator throughout the completion of the questionnaire for addressing any potential misconceptions about it increases the validity of the given responses. Additionally, dietary habits were evaluated by a Food Balance Score that has been developed for the present analysis, and no validation has been performed before. Finally, the majority of children were living with both their parents and therefore, family structure did not have a considerable variability to test complex relationships as the current one.

Although, this study found no association between family structure and dietary habits of children, this deserves further attention and more studies in this field in order to confirm or refute the presented finding. "*The absence of evidence is not evidence for absence*".

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